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EDITORIAL NOTES.

Work Waiting on Whitehall.

In the interesting address on industrial problems delivered last Wednesday by Sir Arthur Duckham, as President of the Society of British Gas Industries, he stated that there was, practically speaking, a slump in trade in several of the great industries of the country. There is a slump in the gas-plant contracting industries; and in them unemployment is growing, though there must be a considerable amount of work standing over from the past seven years that requires execution. The burst of work succeeding the war, due to suspended contracts, imperative repairs, and the minimum of extensions, has exhausted itself; and now there is a slump, which is not altogether due to disinclination on the part of gas administrators to launch forth into work which should be, and must be, carried out before very long. There is naturally some amount of hopefulness that there will be a further reduction of costs ere we are much older; but this is not the sole reason for the delay in pushing on with necessary work.

Sir Arthur in his address spoke of several things which contribute to the complex mass of circumstance that causes unemployment. The conditions which have brought us to the present pass are not only of home origin; some of them are world-wide, and cannot be dealt with. But so far as the Government are concerned, it is rather interesting to observe how they have—in part unavoidably, in part unfairly—piled upon industry burden after burden, apparently with the view of getting all financial succour they can from this quarter until they have found experimentally the breaking-point. They have found it at last. They have been almost as bad as the trade unions in this matter of bleeding industry, and helping to cripple it so that greater unemployment is the result. Now the Government are searching all possible avenues in the effort to find out means by which they can ameliorate some of the trouble of unemployment which they themselves have assisted to create, and are still assisting to create and maintain. They have called to their aid certain wise men in finance and industry, to assist them in devising schemes for consideration to boost-up trade and so employment. But it may not be within the cognizance of these counsellors, nor of the Premier or other Ministers, that there is work—productive work—actually waiting in this country to be done, if only something could be applied to one of the Government's own departments in Whitehall, so as to smarten it up in the matters of inquiries and sanctions for loans, in order that work may be proceeded with. "As "things have been, so things shall be" appears to be a rule that cannot be dislodged from the minds of some men brought up and trained in the principles of bureaucracy. But things outside their official orbit have changed; and the people want their disobedient servants in Whitehall to apply to their functions in future not the leisurely ways of past days, but the business methods that have better accord with the times' requirements and the people's expectations.

The address by the President brought from members of the Society a grievance against the Ministry of Health for blocking, by slow dealing in these critical times, work that would keep many men employed, and give occupation to some who are now unemployed. Mr. J. W. Broadhead spoke of contracts for work for municipal gas departments being issued subject to the sanction of the Ministry to loans; and of the work being hung-up waiting for the long-deferred inquiry by, and decision of, the department. Similar complaint of dilatory movement by the department was made by Mr. R. J. Milbourne and Alderman George Clark; and the view was freely expressed that the Society should attempt to do something to urge upon the powers that be that matters should be speeded-up, so that waiting work may be at once put in hand. At the dinner of the Society in the evening, the President gave it as his opinion that orders for gas plant for municipal works of the value of at least half-a-million sterling are simply waiting the convenience of the department while works and men are standing idle. Meanwhile, the Prime Minister is considering with his governmental and co-opted experts what can be done to create work. The Ministry of Health should evidently be embraced in the investigation, for there is work here not to be created, but in existence, and yet blocked by the creeping methods of those entrusted with the power of loan sanction. However, a move is to be made by the Society in the proper quarters to see what can be done to hasten up inquiries and sanctions, by scrapping dilly-dallying procedure, and supplanting it by methods more in accord with the needs, the new life, and the fresh ideals of these times. In the name of reason, do let us have real business methods applied to the work of Government departments. We know of sections of departments that are an example to others in this respect. But in all Government departments, everything in connection with which they have influence should be done by them that will speedily bring into being good productive work, for we are now at a time of very serious crisis in the matter of unemployment.

Reflections on an Address and Gas-Testing.

The Tynemouth Gas Company has ever been a progressive concern. What it has been, it is now. This was seen in the Presidential Address of Mr. F. C. Willis to the North of England Gas Managers' Association last Thursday. The consumption of gas in the Company's area last year was no less than 697,708,000 c.ft., which is about nine-and-a-half times what it was fifty years ago. This development of business has not been secured without consideration and an application of all those principles and elements which constitute "good service;" and this is evidenced in every part of the address, whether the President is dealing with manufacture, the calorific value of gas, naphthalene, cyanogen compounds, distribution, lighting, or any of the other matters which come into good gas business and service. Moreover, there are no more staunch adherents than the Company to organized co-operative effort, nor greater admirers of the work that has been and is being performed by our head organizations. The whole address is an eloquent record of experience that is an encouragement to the devising and application of an enlightened policy in the conduct of a gas business. We see in it the influences of the prudent practices of our old friend, the late Mr. William Hardie; and their persistence shows the appreciation and wisdom of his successor. Naturally, the address surveyed the labour situation, referred to the coal strike, and to the difficulties that have come not singly but in massed formation upon the heads and shoulders of the devoted men of the gas profession, and with successive and obdurate attack—each succeeding one being, if anything, worse than that which preceded, through the fact that there has not yet been time and opportunity to recover fully from the influences upon plant of war-period conditions.

Keeping close observation on the industry, we may say this, that whatever may have transpired behind closed doors or at meetings of shareholders, there has not been that public recognition which we expected, and is deserved, of the work gas engineers have successfully done in meeting

the needs of communities both large and small in the many times of grave emergency during the past seven years, and in which work they have received no help but much repression from labour outside the industry. In this connection, the address—not positively, but through its varied subject-matter—impresses upon the technical reader another point, which may escape the directors and committeemen administering gas undertakings. It is the tremendous growth of the responsibilities of gas engineers under the changed conditions of gas supply. There are not only the questions of the quality of gas to be supplied under the liberty afforded by the Gas Regulation Act, and the character of plant best suited in the changed circumstances of the gas-supply business and secondary products markets, but there is the extension of chemical supervision, as well as distribution problems, and the necessity for the utmost protection of plant and the distribution network from the assaults of corrosive ingredients of the gas—such as hydrocyanic acid. In this last-named respect, at Tynemouth good use is made of oil, both in washing for naphthalene and in the making of carburetted water gas; and this affords some protection. At the same time, there is gratification on Mr. Willis's part that Mr. J. G. Taplay, the Research Chemist to the Life of Gas-Meters Research Committee of the Institution of Gas Engineers and the Society of British Gas Industries, has indicated the promise of a readily applicable method for dealing effectively with this insistent agent of mischief. All these matters, and much more in the address, show how considerably greater to-day is the responsibility of the chief technical official of a gas undertaking, and how much more the administrative members have in the changed circumstances to rely on their technical official for the success of the undertaking and the general protection of the property. His work is the basis of financial security—not only in trading, but in respect of the capital that is represented by the plant and appliances.

Incidental reference has been made to water gas. The address mentions a point that will interest the defeated advocates of a limitation of carbon monoxide. During the coal strike, the Company were compelled to increase to 75 p.ct. the proportion of carburetted water gas distributed; and occasionally it reached 90 p.ct., and even took flight to an undiluted 100 p.ct. With such unavoidable variations, there was naturally some inconvenience and trouble with consumers' appliances. But up to 50 p.ct. of carburetted water gas, the effect was an all-round improvement in respect of efficiency, especially in incandescent burners—the greater quantity of carbon monoxide resulting in a distinctly marked higher thermal intensity of the flame.

The members of the Association, as will be seen in the next article, had brought before them the question of the calorific value of gas which it is most desirable to declare in conformity with local conditions. This "in conformity" point is one that must not be overlooked. There is too much talk in some quarters of a nature which would lead a stranger to suppose that gas undertakings work under universally standardized conditions in respect of coal, plant, and local applications of gas. The facts do not lie in that direction. So it is that while Mr. Willis considers that in his circumstances 450 to 475 B.Th.U. gas will give the best all-round results, Mr. Shadbolt (as will be seen) is satisfied that his and his customers' economic figure is round about 400 B.Th.U.

In this connection, the President makes some comments as to testing under the new order of things, which arrest our attention. He says: "Without experience of working "under the sections relating to the method of testing, &c., "which will be ultimately imposed upon us, it is perhaps "premature to pass an opinion. But I am constrained to "express the view that the form of test to which we are to "be subjected is indeed very severe; and it is questionable "whether any commodity of public utility has ever had "parallel conditions imposed—not even the water we drink." With this we agree up to a point; but there is no need to fear the severity under normal conditions. The fact that the testing will be severe or exacting should give the public the greater assurance in the matter of only paying for value received. There is something over which to be gratified in respect of the change; and it is that the gas engineer's position has not been rendered more onerous by the infliction of restrictions in respect of inerts and carbon monoxide. There is little use anticipating difficulties that may never arrive. If they do, and are found to be unreasonably heavy, something will have to be done in the way of redress. But let us say this to Mr. Willis, and to others who think similarly with him in respect of this matter: We are confident the Director of Gas Administration at the Board of Trade, the Gas Referees (Prof. C. V. Boys, Mr. W. J. Atkinson Butterfield, and Dr. J. S. Haldane), and the Chief Gas Examiner (Sir Richard Glazebrook) fully recognize that the gas industry is starting-out on a new road, and that at the initial stages the position will be largely experimental. No reasonable person can expect that the industry is going to begin on a new course of operation as though it was only new in respect of general application, and had been established sufficiently in practice to present all the necessary guiding experience. "We shall look," says Mr. Willis, "for "reasonable consideration, especially in the earlier stages of "this new *régime*." Gas undertakings will get this reasonable consideration. "And certainly before there are ques-"tions of penalty all the facts should be fully taken into "account; and where the question of low quarterly averages "are to be taken into the calculation, there should be as a "matter of equity some offset for high averages. It is im-"possible for circumstances like strikes and delays in the "supply of coal, oil, retort materials, &c, such as have "arisen repeatedly during the past few years, not to have an "adverse effect upon calorific records, however careful the "work of supervision and management." We feel confident that all the consideration and adjustment that circumstances demand and justify will be found in the quarters already named. Unavoidable and exceptional circumstances come within the purview of the Chief Gas Examiner; and Sir Richard Glazebrook (long the Director of the National Physical Laboratory) knows well, if unavoidable and exceptional circumstances intrude themselves and mar even scientific work, how much more liable are ordinary commercial processes to disturbance from their normal procedure, and therefore from normal result. We are not anticipating any difficulty under ordinary conditions. The Gas Referees have shown that they are not going to be hustled into making prescriptions; that their policy is temporary, moderate prescription; and that not until trial has produced guiding light, will they be prepared to issue their permanent instructions. Everything that they do will be done by judgment formed from working-scale experiment combined with experience. This gives us faith that at the present time we need not worry ourselves by anticipating testing difficulties.

Strike Experiences—400 B.Th.U. Gas Favoured.

MOST of us have indulged in reflections on the three months' coal strike from our own particular points of view or from studied observation. Mr. S. Shadbolt, of the Southbank and Normanby Gas Light Company, composed a paper, and last week he read it before the North of England Gas Managers' Association, giving his reflections on the strike in relation to matters that impressed him most as a gas manager within the limits of his own particular operations, and with the material and plant at his disposal. If all gas engineers and managers were to make public their reflections and all they felt during the strike, some of the matter, we fear, would not be printable, and would not add to technical information and progress. But now that things are working more smoothly, and there is coal in abundance, reflection and impression are possible in a calmer atmosphere; and the lessons of the strike can be considered in a broad contemplative spirit. Mr. Shadbolt had experience with a variety of material and plant, which permitted the supply of straight coal gas, Tully gas, and blue water gas, mixed or individually undiluted. And he had to alternate his working and supply calorific qualities of gas not so much according to his own inclinations, but as his supplies of material dictated. This was largely the position of many gas managers; and the experiences, forced and unwelcome, will be valuable in directing decision to the quality of gas to be supplied in future under the therm basis of charging.

Before noticing Mr. Shadbolt's experiences in that regard, let us say this: Now that the miners, politically but not wisely led, have had their great spectacular display, and have caused no end of mischief to themselves, their industry, and the industries of the country generally, and all over matters now acknowledged to have been a huge mistake, the responsible gas manager must not allow himself to be lulled into a false sense of security by agreeing too pronouncedly with the author of the paper, that we need hardly anticipate a repetition of a miners' strike in the near future. We are not anticipating one. The miners, after the strike

of twelve months ago and then the three months' strike this year, are, to put it colloquially, just about "fed-up," and are mightily in debt. But we have to-day to take more than a sectional survey of labour affairs. Federations and alliances and international agreements are growing policies; and the possible developments and effects are unknown quantities. We are not desirous of being ranked among alarmists; but we do suggest that a liberal prudence is not at all a bad trait at the present juncture in deciding on policy as to the degree of assurance that stocks shall give in future. The industry has pulled through the strike; it has carried on; it has been a friend to the community in the weeks and months of its direst need. It was its business; and the men of the industry are proud of their achievements between April 1 and the end of June last. But Mr. Shadbolt asks at what cost was this done? His belief is that many boards and committeemen will on reflection decide that the price paid for the continuity of supply is higher than was warranted; further that recent experience will probably mean that many undertakings would not readily again pay the price to carry on with so little tangible compensation in view, should any similar position ever develop. Should this unfortunately be the case, history will repeat itself. But perhaps then there will be more tangible compensation. The cost was tremendous; but it was not all due to the price that was paid for coal. Part was owing to the fall in values of certain secondary products. This must not be overlooked. The amount that had to be paid to maintain supply was, of course, heavy. There comes in a point affecting management policy. Labour policy and methods are not what they were. New standards in fuel provision are necessary, or the adoption of plant which requires less coal in relation to the number of therms produced per ton. This means money; but so does the cost of meeting a strike under the terms and conditions with which the last was met. Which is the less costly—ample provision, or the muddle and uncertainties created by insufficiency for the new standard of labour endurance which the recent strike revealed? This is a point to be considered. There is also reference in the paper to the wretched quality of coal that was shipped to us by our Continental Allies. We agree that much of it was of poor quality; some of it was good. Qualitatively it varied considerably. We must not, however, make too much of this point. Some of the coal shipped to our Allies from this country during and after the war was not of superlative quality. We know of one case where the stuff sent was rejected, because the French gas engineer would not suffer it to enter his retorts. And the charges then made for British coal—good, bad, and indifferent—were far in excess of what was charged to this country during the coal strike. The less said about the quality of the coal sent from the Continent the better, though the experience with it of the users was of bitter order.

The best part of the paper is constituted of the impressions derived by Mr. Shadbolt in relation to the calorific values of the gas supplied at different periods, and in compliance with his producing capabilities in the then prevailing circumstances. We have mentioned that he had at his command horizontal (machine-worked) retorts and a Tully plant, and that in the course of the strike he supplied mixed gas and, for about a week, blue water gas. His manufacturing fuels had a wide physical and qualitative variation. We will not go into details, as the paper sets the information out in a manner that will interest. It is the experience of varying calorific quality that arrests attention. Though the experience cannot be termed altogether comprehensive or conclusive, it has resulted in quite a definite opinion being formed by the author of the paper. By the way, it is a very notable phase of gas supply during the coal strike that much less was heard about "bad gas" than during the war, despite reduced calorific values and pressures. This may be due to public thankfulness that they were able to get gas at all; but a good part of it is attributable to the fact that, wherever possible, managers, in making the lower quality gas, did not reduce, but increased their pressures, and considerably more attention was paid to the regulation of consuming appliances. Five years ago, the Southbank Company supplied gas of 500 to 550 B.Th.U. Gradual descent was made, until immediately prior to the strike 400 to 415 B.Th.U. gas was being distributed. During April, the maximum value was 440 B.Th.U.; the minimum, 386 B.Th.U.—the average being 418. In May, the maximum was 399 B.Th.U.; the minimum, 321 B.Th.U.—the average being 359. But in June the calorific power per cubic foot had slipped down to such an extent that the maximum was only 334 B.Th.U.; the minimum, 275 B.Th.U.—the average being 302.

This was a descent that had not been contemplated; but Mr. Shadbolt says it was surprising what careful adjustment did in the way of maintaining gas-burner efficiency—particularly when dealing with boiling-rings and lighting. At the end of the paper, he gives some water-boiling tests. Their lessons are not conclusive in respect of all uses of gas, but at the same time they are interesting. We are not clear, however, why Mr. Shadbolt kept to a fixed rate of consumption of 15 c.ft. per hour in the case of three of the gases. The first gas was a mixed gas of 421 B.Th.U. gross; and 15 ft. per hour would mean 6315 B.Th.U. per hour. The second gas was mixed gas of 407 B.Th.U., which, at 15 ft. per hour, makes a rate of 6105 B.Th.U. The third test was with Tully gas of 333 B.Th.U., which, at 15 c.ft. per hour, makes a rate of 4995 B.Th.U.—a big difference in the passage of potential heat units. It would have been interesting if the rate of flow of B.Th.U. had been a fixed one—say, 6000 per hour. The differences in efficiency between burners "A" and "B" would lead one to reject the latter without hesitation; but the results illustrate how the burner as well as the gas affects efficiency. Under the conditions of the tests, they show remarkably little variation in efficiency; and they are confirmed by reference to the results of the researches of the Gas Investigation Committee with gas of greater range in calorific value and varied composition. Another interesting series of tests is that for lighting with various burners, and a mixed gas of 409 B.Th.U. gross, and Tully gas of 339 B.Th.U. gross. It is remarkable, taking each burner separately, what a little difference is shown between the two gases in efficiency expressed in terms of B.Th.U. per candle-hour. There is again evidence here of the effect of the burner upon efficiency. With one burner, the Tully gas shows an efficiency superior to the mixed gas; but in all cases the differences are really so small as to be negligible for practical purposes. However, Mr. Shadbolt says the general satisfaction was marked and gratifying when the Company were able to revert (after falling deeply below) to the 400 B.Th.U. gas. Hence experience and tests, he thinks, justify his contention that—mixing good straight coal gas with gas made by total gasification plant as a diluent (and without atmospheric inerts)—400 B.Th.U. gas should be the popular standard under the new order of things. But the fact remains that the popular view, according to the Gas Regulation Act declarations, runs between 450 and 500 B.Th.U. Southbank and Normanby apparently are fully content with their 400 B.Th.U. supply. It will be noted from the tables that the plain Tully gas showed the lowest total inerts—12·6 p.ct. in the boiling tests, and 11·4 in the lighting tests.

Engineers in Local Government.

THE work of municipal and other urban authorities deals to-day very largely with matters in which engineering is involved, and this side of their work is extending year by year. The capital involved in engineering works under municipal management is great and is growing rapidly; and the day-by-day responsibilities become heavier. We have only to take up official returns and compare them with ten, twenty, or thirty years ago to find evidence of this; and we have only to exercise our powers of observation over gas, electricity, and water supply undertakings, and tramway, sewerage, and road systems and work to become impressed by their very magnitude. When addressing the Manchester Association of Engineers from the Presidential Chair the other night, Mr. Fred. J. West, C.B.E., dwelt upon the extent to which engineering enters into the enterprises and the developments of our large towns, and in less degree, of course, of all towns and areas; and, as a city councillor and an engineer, it has been a matter of interest to him to observe how largely developments of these matters are in the hands of administrators (good men and true most of them) who are absolute strangers to the principles and practices of engineering. Local authorities often appoint engineers on written testimonials only; they examine (or are supposed to examine) engineering schemes without themselves possessing technical qualification for doing so; and, in their ignorance of such technical matters, they have to accept or reject, and sometimes are guilty of rejecting when acceptance would be the right and ultimately the most economical course. When it is realized that Manchester, standing alone among all the local authorities of the United

Kingdom, has invested 19 millions sterling in water, gas, electricity, and tramways, and has a salaries and wages bill of about 5 millions, there is further attestation of the important place engineering occupies in municipal government generally. There is vast interest and attraction in all this. It shows, too, the immense dependence that civic life has on the skill, the ingenuity, and the inventiveness of engineers. It demonstrates, also, how much they have to rely upon them for maintenance and development of conveniences which serve the people and encourage and assist industrial and commercial expansion.

Despite all this, another observation of Mr. West is that engineers show a marked apathy towards local government, and that in it they are very inadequately represented. Outside they are good grumblers when things go wrong, or do not meet with their approval; but they have not as a body earned a good reputation in Mr. West's mind as voluntary and active participators in the work of local government. Yet who is better fitted and equipped for it? Mr. West does not say, or perhaps cannot say, why this apathy exists among engineers in respect of local government. There must be disinclination lying in some direction; but he at all events has not discovered its cause or nature. It would be of interest to find out something about it, so as to examine and discuss it. However, whatever the reason why engineers withhold their services from local administration, Mr. West shows good cause why the attitude should cease. It should cease not merely on the ground of self-interest, but on the broader claims of local government upon all sections of the citizens. No class of professional men can exercise a greater beneficial influence on the progressive and protective work of municipalities than the engineer, owing to his training, ability, and experience. Questions of an engineering character require very careful handling and discrimination in these days of high costs, and days when new problems are coming into our municipal life—problems affecting, for instance, the conservation of coal and atmospheric sanitation, which will have to come about very largely *viâ* the gas-works. On all points, Mr. West has a good platform from which to appeal to engineers to take a larger part and place in municipal government. There are in the address good words, too, for municipal engineering officers, whose responsibilities have so heavily increased, and will continue to do so, but who have to meet with much criticism born of prejudice, narrow-mindedness, and an incomprehensive grasp of affairs. Municipal technical officers would always find sympathetic feeling and helpful interest resident in the local administrator with engineering training and experience, and so would the officers of companies—such as gas companies—who have many dealings with local authorities, and will have even closer relationships in future under the Gas Regulation Act.

Society of British Gas Industries.

Reference is made in an earlier column to a matter raised in the course of the discussion (at the meeting of the Society last Wednesday) on the address by Sir Arthur Duckham; but there are one or two other points as to the activities and achievements of the Society during the past year to which prominent attention should be given. A special effort has this year been made by the Chairman (Mr. Cyril Davis) to obtain a greatly increased subscription to the British Commercial Gas Association. Probably no one is more alive to the importance of the Society giving a substantial subscription to this organization than Mr. Davis; and we know that he has worked very hard indeed during the year to achieve his object, with the result that the Society has been able to hand over to the "B.C.G.A." a cheque for £5000. We congratulate the Society generally and Mr. Davis particularly. A second point. The members of the Society are now a good deal better able to realize the value of the work done by the Council as a result of the publication of the quarterly "Bulletin," which first saw the light of day this year. This, in itself, is an important event, judging by the great interest shown in the few issues which have already appeared. Then, again, before the end of the year, the first publication will be issued of the Society's "Directory." This will not be an advertising catalogue, but a standard work, dealing with the various goods for which the members of the Society are responsible. It contains a quantity of technical information and other matter of a very useful character. The "Directory" will be sent to all the colonies and to foreign buyers, and should be a definite step towards promoting British trade abroad. Certainly, the aims and objects of the Society, which were formulated many years ago, have been so ably carried out that the organization has now reached a very high plane. The broad-minded and thinking gas engineer of to-day—particularly the new generation—realizes that it is no mere trade body, but that it has high ideals; and the definite object in view is the interest of gas and the gas industry as a whole. It is generally appreciated that co-operation between all branches of the industry is essential if it is to go ahead, and take advantage of the opportunities which are apparent on every hand. It will be remembered that Mr. Davis, who has been Chairman during the past sixteen months, was presented with a gold watch in recognition of his long and useful services, not the least of which was his paper on "The Changed Conditions of Industry," which was full of good points, and clearly stated the industrial position.

Fuel Research Board's Station.

Many gas engineers will be visiting the Fuel Research Board's station at East Greenwich to-morrow in connection with the annual meeting of the Institution; and at the meeting they will be considering the report of Sir George Beilby, the Director, regarding the experiments on a working scale unit of Glover-West retorts, with steaming. From the report to the Committee of the Privy Council for the year 1920-21, it is learned that 2650 tons of coal were carbonized, and that the production of gas was from 40 to 50 million cubic feet. If we take the middle figure of 45 millions, this works out to 17,000 c.ft. per ton, with steaming. The report speaks of the gain in heat units by steaming being from 25 to 50 p.ct. according to the type of coal used, with a substantial gain in tar and sulphate of ammonia. The contras are a diminution in coke available for sale; and extra heat for firing the retorts. But this additional expenditure of coke and heat is relatively small—the gains showing a substantial balance. It can now be said that the use of steam can be accurately specified for any type of coal. The work at the station has extended in several directions—embracing peat and low-temperature carbonization; and about the latter we are going to hear much more of interest. All this work is of considerable national advantage, being of a working-scale order, governed and the results assessed scientifically. The expenditure at the station during the year was £40,889; and the secondary products produced a credit of £3196, or equal to £1 4s. 1·4d. per ton of coal carbonized. Of course, the expenditure must not be attributed entirely to the carbonizing experiments. There is much other work going on. The estimates provide for an expenditure of £54,979 in the current year, and the receipts are put at £6600. There is work going on outside the station, payments for or towards which are mentioned in the information given from the reports elsewhere in this issue.

Peat Carbonization.

The peat carbonization trials at the Fuel Research station appear to have had quite satisfactory results, save in one particular. The report on the subject (noticed elsewhere) states that the gas had a "sickly odour" on combustion, which would make it anything but suitable for town use. Financial information—including the cost of maceration and air-drying—would be interesting. The gas is practically non-luminous; but the make is good. If we take the production of 14,900 c.ft. per ton of 325 B.Th.U., it is equal to 4,842,500 B.Th.U. per ton. Three tons per retort per day would give 145 therms; but the gas industry could not devote retorts to such a production of heat units in the form of gas which gives a "sickly odour" on combustion, when each of the same retorts would supply, carbonizing 2½ tons of coal, something like 200 therms. The carbon dioxide content of the peat gas (as might be expected) is high. About one-third of the total amount of gas made is used for the heating of the retorts. The charcoal residue is 27 p.ct. of the weight of the peat; and this material is reported to be quite good for suction-gas producers. The production of tar is excellent quantitatively; but it contains a high percentage of paraffin wax. The results are regarded as encouraging; and the experiments are to be continued. But probably the results would be even better if the retorts were specially designed for the purpose.

Gas Coal Situation.

The position appears to be much the same. But the reports from certain of the larger coal areas indicate that gas undertakings are more readily purchasing screened and better quali-

ties of gas coal. Business is still being for the most part done at current figures, or on short-term contracts. Northumberland, Durham, Yorkshire, and Cheshire are quarters in which the reported market prices for gas coal show a decline on pre-strike figures. The northern gas undertakings are doing well with their coke; and in some quarters the supply is insufficient for the demand.

WORK OF THE FUEL RESEARCH BOARD.

THE report of the Committee of the Privy Council for Scientific and Industrial Research for the year 1920-21 describes the work that has been done for national purposes; and among the sections is the following relating to the Fuel Research Board.

During the past year, experiments on the use of steam in vertical gas-retorts have been in progress. The retorts have been constantly under heat; and the carbonization of coal and the disposal of the gas and other products have proceeded with the same regularity as would have been the case in a well organized gas-works. Three widely different types of coal have been used —"Consett" from Durham, "Mitchell Main" from South Yorkshire, and a mixture of the "Ell" and "Main" from Lanarkshire. In all, 2650 tons of coal have been carbonized; and the total amount of gas produced has been from 40 to 50 million c.ft. This regular working under industrial conditions has been carried out under the strict scientific control provided for in the lay-out and equipment of the station, and by the organization of the staff.

It has thus been possible to obtain the measurements of the coal used and its products, and of the physical and chemical data involved in the operations, with an accuracy which compares not unfavourably with that demanded in the best laboratory practice. Complete records have been preserved which practically cover every working hour during the past year. These records are being freely placed at the disposal of all gas engineers, in order that they may be in a position to judge for themselves as to the results obtained and the conclusions to be drawn from them.

The results of these experiments show broadly that, by the use of steam under conditions which can now be accurately specified for any given type of coal, there is not only a gain in the conversion of the heat units of the raw coal into therms in the form of gas, amounting to from 25 to 50 p.ct., according to the type of coal used, but that there are also substantial gains in the bye-products, tar and sulphate of ammonia. As against these gains, must be placed the diminution in the yield of coke and the extra heat which must be supplied in firing the retorts. These deductions, which have also been definitely ascertained, are relatively small, and leave a very substantial balance of gain on the operation.

In order that the results of this work should be placed before the gas engineers of the country with as little delay as possible, it was arranged with the President of the Institution of Gas Engineers that the report should be presented by the Director as a paper to be submitted at the annual meeting of the Institution on May 25 last. Unfortunately, this meeting had to be postponed owing to the coal strike; but arrangements were made for the printing and circulation of the paper among the members of the Institution. It will be taken as read; the discussion being adjourned to the meeting of the Institution in October. The account of this work is being issued by H.M. Stationery Office as the first section of the report of the Fuel Research Board for the years 1920-21.* The Board hope to issue the second section of their report in the course of the next three months. This section will deal with the low-temperature carbonization of coal and the carbonization of air-dried peat at various temperatures.

SURVEY OF BRITISH COAL SEAMS FROM THE FUEL POINT OF VIEW.

In the report of the Fuel Research Board for the years 1918 and 1919, reference was made to the establishment of a Survey and Register Department, which would form the nucleus of a general survey of the coal seams of Great Britain from the fuel point of view. A beginning has been made in collecting and collating existing information as to the distribution and qualities of individual seams. Since the taking over of the Geological Survey by the Department, it has been possible to maintain much closer touch with the Director and his officers, whose help has been invaluable in establishing the preliminary work on a secure foundation. Particulars of seams in the Yorkshire, Nottinghamshire, and Derbyshire coalfields have been collated.

The Board contemplate establishing, in some of the more important mining centres, committees charged with the duty of superintending the work of this survey in their districts, and responsible for determining the order in which the seams will be explored. Upon the results so obtained, and assisted by the advice of the local committees, the Fuel Research Board will, if necessary, carry out experiments on a working scale.

DOMESTIC HEATING.

Further grants have been made to the Manchester Air Pollution Board in connection with the inquiries of Dr. Margaret Fishenden into some of the problems of domestic heating. A series of careful tests have been made by her into the comparative radiant efficiencies of coal and smokeless fuel; and it has been shown that the latter possesses marked advantages from this point of view. The tests include work on open grates of various designs, and also embrace several appliances used for multiple purposes—such as kitchen ranges and combinations of open grates and hot-water boilers.

In the report of the Fuel Research Board for the years 1918 and 1919, reference was made to the work on cooking appliances which was being carried out at that time by Mr. Arthur H. Barker, B.A., B.Sc., for the Building Materials Research Committee of the Department. On the winding-up of the Committee last year, the programme which they recommended was by no means completed; and it was decided therefore that Mr. Barker's work should be continued for the period of one year, under the supervision of the Fuel Research Board. Mr. Barker has resolved the complex question of efficiency of a cooking range into a group of simple problems, each of which has formed the subject of experimental work. The preliminary account of this investigation was presented to the Advisory Council in the final report of the Building Materials Research Committee.

PEAT.

Since the publication of the last report, the Fuel Research Board have issued, as a special report, the findings of the Irish Peat Inquiry Committee (appointed by the Board in 1917), together with an outline of the subsequent work of the Fuel Research Board on the general peat problem. During the season of 1920, 100 tons of peat were cut by hand, macerated by the machines at Turraun, and air-dried on the bog, arriving in two consignments at the Fuel Research Station, East Greenwich, in November, 1920, and January, 1921. Some 70 tons of this peat have already been used at the Research Station in practical experiments on carbonization at low temperatures, and in vertical retorts at higher temperatures. It has also been used directly as fuel in the Babcock experimental boiler. The details of the work in this connection have now been published, and further experiments are being arranged with the remaining 30 tons. The results obtained are of an encouraging character; and it is hoped that arrangements may be made for the preparation of a further quantity of peat during the current season.

POWER ALCOHOL.

In concluding a statement regarding the production of power alcohol, it is remarked that the Department have made a grant to the Empire Motor Fuels Committee in aid of research, now being carried out by its Engineering Sub-Committee, in connection with the use of alcohol-and mixtures of alcohol with other liquid fuels in internal combustion engines.

* See "JOURNAL," Vol. CLIV., pp. 542, 609, and Vol. CLV., p. 317.

COMMITTEE ON SCIENTIFIC AND INDUSTRIAL RESEARCH.

Report for the Year 1920-21.

THE period covered by the sixth annual report of the Committee of the Privy Council for Scientific and Industrial Research [issued last week by H.M. Stationery Office, Imperial House, Kingsway, at the price of 1s. net] is the twelve months from Aug. 1, 1920, to July 31, 1921; and in this time the most important development in the work of the department has been that connected with the operations of the various new Boards. It is said that the curtailment of the resources at their disposal, due to the financial position of the country, is causing the Committee and their Advisory Council very great anxiety. Indeed, the limitation which has already been imposed on the expenditure of the Department will, one is sorry to learn, inevitably involve the postponement of a certain amount of research work which the Committee consider of importance in the national interest; while over the whole programme of work of the Department, its effect will be to retard progress and to delay the stage at which results will become available.

The important work undertaken during the present year by the Fuel Research Board [to which fuller allusion is made above] is duly acknowledged. It is stated that the expenditure on the Fuel Research Station in the year 1920-21 was £40,889; while the receipts from the sale of bye-products amounted to £3196. The expenditure on the work of the Board elsewhere than at the Fuel Research Station was £3683. Provision has been made in the estimates for 1921-22 for an expenditure of £54,979 on the Fuel Research Station, with receipts put at £6600. The expenditure elsewhere than at the Fuel Research Station is estimated at £7985. As to the National Physical Laboratory, the total expenditure in the year under review was £203,865, and the receipts £45,770.

A total of 26 Industrial Research Associations have been now approved by the Department; and in the year ended March 31, 1921, the expenditure on grants to the Associations came to £74,557. The balance of the £1,000,000 fund then remaining unexpended was £903,205; but of this sum a large percentage has already been earmarked for prospective commitments to Associations already formed. There were 18 grants, totaling £20,912, made in aid of scientific investigations conducted by other bodies; and 132 allowances were made to students to enable

them to take advantage of the facilities for training in research offered by various universities and colleges, besides a number of grants to independent scientific and research workers.

The report follows of the Advisory Council, to which during the past year Prof. J. B. Farmer, F.R.S., and Sir John F. C. Snell, M.Inst.C.E., have been added—making twelve members in all, in addition to the Chairman, Sir William M'Cormick. The Council review the work of the various Associations; and in connection with the British Refractories Research Association, it is remarked that reference was made in last year's report to the researches into refractory materials which had been conducted at Stoke-on-Trent by the Institution of Gas Engineers, with the aid of a grant from the Department. The hope was then expressed that the Refractories Research Association, when formed, would accept the responsibility for the future conduct of these investigations. The Research Association came into being in July, 1920; and arrangements have since been made with the Institution of Gas Engineers to hand over to the Association all the research work on refractory materials hitherto carried out by the Institution.

In the second part of their report, the Council describe the work that has been done for national purposes; and it is here that the section is given relating to the Fuel Research Board which, as already indicated, appears on another page of this issue. In connection with this matter, it may be noted that arrangements have been made by the Geological Survey Board for a full co-operation of the Survey with the Fuel Research Board in the work of collating such information bearing on the national coal resources of the country as forms part of the programme of that Board.

The Gas Cylinders Research Committee during the year presented their first report, dealing with the specification of cylinders for the storage and transport of "permanent" gases. The Committee, with one dissentient, expressed the view that the use in commerce of lighter cylinders made from high-carbon steel may, with certain closely specified guarantees, be safely recommended. Preliminary steps were taken to arrange for work, in conjunction with the British Engineering Standards Association, upon the standardization of the fittings of gas cylinders.

The research work on the transmission of heat through building materials has been continued by Mr. A. H. Barker at University College, London. On the results already obtained, the Institution of Heating and Ventilating Engineers have issued to their members a series of constants giving the coefficient of the over-all transmission of heat for a wide range of materials. A further grant on a pound-for-pound basis has been made to them, in order that they may undertake work on the efficiency of standard radiator elements.

ELECTRICITY SUPPLY MEMORANDA.

ELECTRICAL manufacturers appear to have been kept comfortably busy with the carrying through of orders that were given out some time ago. That was before conditions became so stringent and onerous, and before the Electricity Commissioners began to exercise their power of veto upon electricity schemes which interfered in any way with the policy of the co-ordination of generation, and could in their opinion be dispensed with by taking bulk supplies. Since these things came about, and the financing of schemes became extraordinarily burdensome through the cost of money, materials, and labour, the orders for new plant have been rather exiguous in character. One electrical contractor's representative has told "Electrical Industries" that the new orders for turbines during the past three months only number three. The delay and confusion over the formation of joint electricity schemes have had a depressing effect; and financial conditions are bad for raising loans. It is indicated that what is wanted is a clearing away of all obstacles to the extension of existing supplies. Our contemporary finds it difficult to see why—because matters are in an unholy mess in regard to joint authority schemes, and because legislation is necessary to authorize the financing of the schemes—progress should be delayed. It is altogether sceptical of such joint authorities obtaining money even under normal conditions; and, as the present situation must be regarded as critical, it is doubtful of the advantage of the policy of waiting until a perfect system is evolved. Whether there is waiting or full play is given to the extension of existing plants, the same financial considerations must apply. Money is expensive; and the money would have to be spent on plant that costs (say) three times what would have been required before the war for a unit of equal capacity.

The Outlook and the Facts.

There must be a lot of wealthy people in the country. Our contemporary, following up its argument in favour of present plant extensions, says the demand for current is practically unlimited, and among existing consumers there is a wide field for development. This looks and sounds cheerful. If the demand is practically unlimited, it can only be among people who can afford to pay the prices of the electrical energy gormands and their installation, and the costs of the current consumed in them. The dam to the flow of new business is not a monolithic structure; it has several components in its constitution. One of them is the value for money as measured by what can be obtained by the use of other agents. These conditions are rather depressing for the people who have the more expensive articles and agent to sell. It is not conducive to the putting forward of the greatest energy; and supply undertakings are charged with inertia in the matter. But there is a sort of "cheer-up" appeal in the article, and an airy confidence as to what can be done. We read that with the aid of the Electrical Development Association and their organized publicity agencies, co-operation with the manufacturers in working-up a special seasonal demand becomes simple. Does it? The Association cannot ease the financial situation; and there is a point in the sale of appliances below which the manufacturers cannot go if they are to earn a profit. There must be the demand. But this, before the question of increased energy was introduced in the article, was said to be practically unlimited! That apart, if the demand is not existent as alleged, then our contemporary is of opinion that only a very elementary form of commercial knowledge, and a moderate—meaning apparently not the "greatest"—amount of energy are needed to supply a useful part in transforming public desire for electricity into positive demand. Thus the problem of the development of business is an easy one for the electricity industry; and yet, while our contemporary is capable of recognizing this, responsible electrical officials are evidently not similarly capable. They must be mightily dull-witted and short-sighted, seeing it is the opinion of "Electrical Industries" that "only a minority of the central station engineers realize the necessity of organization on that side of their undertakings." Obviously, a few dismissals and the introduction of more active men are desirable. At least that is the deduction which is made from our contemporary's plaint and criticism.

An Unlimited Demand, but Energy Needed.

The disastrous and money-destroying fire at the Printemps stores in Paris has continued to attract considerable public interest—not only in the capital city, but farther afield. The electrical papers have not given much notice to the catastrophe; and there is no information as yet that the Electrical Development Association are going to introduce the subject in their business-getting literature. A report from Paris says: "The judicial inquiry into the conflagration has so far given no result; but there seems no doubt that it was caused by a short-circuit, for immediately the light went out the first column of smoke was visible." The fire has produced a very fair article on the subject of short-circuits in "The Times" from "A Correspondent." Quite naturally he has a tilt at those who always ascribe fires to short-circuits. Of course, all fires have not electrical origin. But electricity has been responsible for not an inconsiderable number, and some of them have caused tremendous destruction. This is a result of electricity being so largely employed in imposing buildings containing an immense amount of valuable property. The writer says nothing whatever about electrical fires so frequently arising in a manner that defies detection, or that do not raise suspicion until the fire has got good hold of the premises. We ourselves have seen cases where fires have been caused by short-circuits, and have not been noticed until there has been visible damage. If the place happens to be shut-up premises, or in occupied premises if a "short" occurs in the night, a complete hold of the premises may be secured by fire before information is obtained, and communication can be made in the proper quarter. The writer of the article attributes a large proportion of electrical fires to the prevalent pressures up to 250 volts, which "years ago, in a weak moment, the Board of Trade allowed the electricity supply concerns to lay on to our houses." Were 100 volts the maximum allowed, accidents would be rarer; but a return to such low pressures is, of course, impracticable. So things must be taken as they are, and as much safety realized as is possible. The article goes on to refer to the danger of the use of flexible cords. If these could be diminished, a fruitful source of risk would (as he says) be eliminated. The trouble is that such cords are usually allowed to continue in use until they become much worn or damaged. In the case of flexibles attached to table lamps, for example, they may, if injured, burst into flame; and window curtains, or other combustible material, may be quickly ignited, and the room soon be blazing furiously. There is also allusion to the question of the tampering with fuses by unskilled persons. In this connection, it cannot be too widely known that, in the case of a short-circuit, it is the fuse alone which prevents disaster—hence an excellent reason for fuses not being tampered with by incompetent persons. It is admitted that the fuse has yet to be perfected which shall be practical, and yet proof against the wiles of the handy man armed with hair-pins or a supply of soda-water bottle wire. It is suggested that the risk of accidents with flexible cords could be perceptibly diminished if the fire insurance companies in this country followed the lead of the Board of Underwriters in the United States, and refused to countenance the use of cord not complying with a definite standard. The concluding paragraph of the article is extremely interesting, and touches upon a point already made. It says that short-circuits "spring on us sometimes from hidden places under floors, and behind wainscots and skirtings." In this connection, the advice is given that there should be anticipation by adequate periodical inspection, and testing of the electrical arrangements in the house. What is meant by "adequate" is not defined; but the householder is advised that the charges for

Electricity and Fires.

such inspections should be regarded as an addition to the fire insurance premium. This, by the way, would make the premium somewhat heavy, and yet, with electricity, an advisable one.

Glasgow to Try Electric-Cookers.

The Glasgow Electricity Department has a Propaganda Committee. This is no doubt a very good institution for a large trading concern of the kind. Possibly in it there may be something worth imitation by other undertakings. To the Committee the Manager of the Department has reported that a large number of inquiries have been made at the show-rooms regarding the hire or hire-purchase of electric-cookers. He does not say whether those who made the inquiries are anxious to have experience, nor whether the inquiries were merely due to passing curiosity. Of course, there may be several people in Glasgow who desire to obtain experience with such cookers, and the result of their experience may be that the number of inquiries will in time show a considerable tailing-off. Apparently news of experiences elsewhere, and of derelict electric-cookers, has not reached the citizens of Glasgow who have been investigating the matter at the show-rooms. But possibly when they have had due experience of the trials inflicted by electric cooking, they will return to the Gas Department, and ask for the reinstallation of the reliable and time-saving gas-cooker. However, it is reported by the Manager of the Electricity Department that the cost of a cooker suitable for hiring-out is £12 10s.; and the cost of wiring would be £5 10s. It is seen from these figures that the expenditure on the wiring alone is equal to 44 p.ct. of the cost of the cooker. The two items together make £18. It is not stated what sort of cooker the consumers will get for this. Nothing is said as to the size, nor as to the convenience that is afforded, nor as to the details of structure. The Manager has been authorized to purchase 100 of these £12 10s. electric-cookers, which will cost in the total £1250, *plus* £550 for their installation, or £1800 for the 100 cookers. Nothing has yet been decided, or had not been when the report was published, as to the charges for hire or hire-purchase of the cookers; but hint has been given that the rent will probably be in the neighbourhood of £2 a year, or 10s. per quarter. Taking interest, repair, and maintenance charges, at 15 p.ct., this would make £2 14s. on the £18; so that on the basis of 15 p.ct. £2 per annum would not be nearly enough to cover the charges. Of course, the maintenance expenses with electric-cookers vary from year to year—principally according to the condition of the elements. If enough is not charged for interest, repair, and maintenance, naturally the additional cost would fall on the electric current; and this for cooking purposes is supplied, as a rule, at a cheaper rate than electricity for lighting purposes. The "Electrician" has a comment on the subject of this new departure at Glasgow. It acknowledges that electricity "has not attained its full development so far as cooking is concerned." We see very good reason why it should not have done so, and many users of electric-cookers know these reasons from practical experience even better than we do ourselves. However, the fact that it has not attained its full development, so far as cooking is concerned, is said to be no doubt due—at least with regard to the smaller householder—to the comparatively high cost of purchasing and installing the necessary apparatus. This being so, what reason can our contemporary give for the larger householders not having shown any magnificent adoption of cookers, the heating agent in which is electricity?

Power Consumers' Dissatisfaction.

The comment recently made in the "Memoranda" as to the discontent between electric power consumers, ordinary consumers, and ratepayers, on the one hand in regard to the prices respectively charged, and on the other hand the disposal of surplus profits by municipal concerns has received further confirmation—this time at York. In this instance, the matter seems to show a feeling of dissatisfaction as between the power consumers themselves. One of the things they cannot understand is that the differences in the circumstances of demand may make an appreciable variation in the charge that can be legitimately made. Here we have the well-known firm of Messrs. Rowntree & Co., who are large consumers, granted special rate facilities because of their circumstances of demand. Lately there has been a renewal of the agreement with the firm at the old rate per unit. This has upset other large consumers, who have come along, and made application for supplies to be given to them on the same basis as that in the case of Messrs. Rowntree. Among others, the North-Eastern Railway Company desire a supply of current, despite the fact that they have an extensive generating plant of their own. Naturally, the Railway Company will want a tempting price, in order to induce them to scrap their own plant, and adopt the Corporation supply entirely for lighting and power purposes. Then there are the applications already mentioned for reduced power charges, which would no doubt lead to increased demands. Here comes in the question as to whether the Corporation would be able to enlarge their generating capacity, and make the whole project pay by supplying current at a specially cheap rate for bulk quantities. Of course, an undertaking of the kind must be regarded as a whole; but at the same time one cannot ignore the fact that these new power consumers whose demand necessitates the provision of plant at present-day costs, and yet who require special consideration in the way of prices, do directly bring upon the whole undertaking a burden which the other consumers have to share. Therefore, there is some excuse for resentment by the existing consumers for special consideration in respect of price to newcomers.

Electric-Furnaces.

An article has appeared in "Electrical Industries" from the pen of Mr. E. P. Barfield, in which he seeks to show, by postulation, that electric-furnaces are the superior of gas-furnaces in all respects, even in that of running costs. Of course, it is quite an easy thing to make statements to this effect; but it is a more difficult thing to prove them in practice. If all he says be true, then the question arises, why are our manufacturers so foolish as to keep in use, and constantly add to them, furnaces which employ gas for heating? It seems that Mr. Barfield is of opinion that the answer to this can be found in the fact that the uses and advantages of electric-furnaces are not yet fully appreciated, and that, when they are, more active steps will be taken to interest consumers who are at present using gas or solid fuel for similar heating purposes. He says that one outstanding feature of an electric-furnace is that its output can be guaranteed, and on this point alone it is in serious competition with gas-heated furnaces. He points out that with gas the calorific value and the pressure are rarely constant. Of course, what Mr. Barfield says shows he does not know much about the combustion and mechanism of gas-flames. It so happens too that, under the new order of things in relation to gas supply, both calorific value and pressure will compulsorily have to be maintained at approximately constant levels. But even before this gas-furnaces could be regulated to such a nicety—this being one of the strong points of commendation—that both the quality and quantity of output could be guaranteed with the greatest assurance. The writer tells us that electric furnaces and muffles are of numerous types, differing both in design and construction according to the purpose for which they are required. He mentions furnaces for melting, tempering baths, and hardening furnaces, as well as carburizing furnaces; and then he comments on their advantages, mentioning among other things cleanliness and absence of fumes, which, of course, is one of those silly smacks at gas-heating which some electrical men cannot avoid. We will not become personal by inquiring the reason why. He claims for electric-furnaces that they are "fool-proof," and cannot be burnt-out through negligence. In mechanical design they are quite as robust as their gas cousins. On the whole, Mr. Barfield is of opinion that standard types of electric furnaces and muffles are made which more than compete with those of the gas-heated variety. He adds, when it comes to the question of running cost, all cases investigated show that an actual saving over gas is obtainable in direct running costs. The saving on cost per unit of product is said to be still greater, owing to the uniformity of results. For all these sayings, we look in vain in the article for data, confirmative or otherwise. If available, it is there that one might find the reason for the statement towards the conclusion of the article that "it is quite surprising how feeble are the efforts made to displace the very numerous gas appliances now in use."

POSITION OF ENGINEERS IN LOCAL GOVERNMENT.

From Mr. Fred J. West's Presidential Address to the Manchester Association of Engineers.

At the Meeting of the Manchester Association of Engineers last Friday, Mr. FRED J. WEST, C.B.E., the President, delivered his Inaugural Address, in the opening remarks of which he acknowledged the kindness of the members in electing him to a position which had been occupied by so many distinguished and practical men. His greatest pleasure in undertaking the duties was found in the fact that his respected father was the President in 1890 and 1891. He mentioned that Mr. John West is now the Senior Past-President, is still hale and hearty, is keenly interested in the progress of the Association, and at the ripe age of nearly 83, sent his warmest greetings to the members.

Mr. West then proceeded to address his audience on what were practically two distinct subjects. In the first one, he dealt with the position of the engineer in local government; while in the second part he referred extensively to the industrial question, and gave his views as to the causes of unrest and how best they might be avoided in future. The first topic is one of comparatively novel interest; and therefore we reproduce this portion of the address in its entirety.

The activities and development of a municipality, such as that of Manchester, are very varied and far-reaching; and the statement will not be disputed that the city presents one of the best examples of municipal management in the country. To me, as an engineer and a member of the City Council, it is interesting to observe the extent to which engineering assists in the enterprise and development of any large town. The supply of cheap power and lighting for industrial, commercial, and domestic purposes, for example, depends upon modern engineering plant and equipment in connection with its gas and electricity undertakings. An efficient tramway service, an ample supply of water, well-paved streets, and the disposal of sewage, embrace civil and mechanical engineering problems which, rightly solved, contribute to efficient public utility services. In all these respects, while the engineer-

ing industry has contributed materially to the solution of municipal problems, it must, on the other hand, be frankly acknowledged that it is itself dependent in no small degree upon the successful working of these services.

Space does not permit of any detailed reference to the public utility services in a city like Manchester; but the hugeness of only a few of the principal departments may be gathered from the fact that the combined capital expenditure of the water, gas, electricity, and tramway undertakings to March 31, 1921, amounts to approximately nineteen millions sterling. The administrative side of the many activities of the city, too, is only superficially gauged by the statement that the officials and the employees of the many departments number approximately 24,500, with an annual salary and wage list of over five millions. These imposing figures show how extensive is the inherent capacity of municipal enterprise, in promoting and supplying the indispensable necessaries and conveniences of our daily communal life, for the fruitful investment of money, and the provision of employment, which spread their effects far beyond the limits of direct municipal government, deep into all the industrial fields contributing to municipal requirement. And these figures, imposing as they are for Manchester alone, would have to be multiplied many times to show the aggregate of the investment of capital and of the measure of employment of the combined local authorities of the United Kingdom. In all this, engineering has a deep-rooted and very real interest—not always obvious to the unthinking.

Despite, however, the dependence upon the skill, ingenuity, and inventiveness of the engineer for the solution of municipal problems and development of schemes, it is to be regretted that, in the actual management of municipal affairs, engineering is not adequately represented. The training and experience of the engineer are pre-eminently of the best for the administrative work of a municipality, concerned as it is with many engineering and industrial problems, which require solution on the lines of economy with efficiency. But whether it be that those engaged in engineering are so engrossed by their occupations, or that the demands of their work are so onerous and isolating, the fact remains that they are not represented in public activities in a manner and degree that their experience and usefulness suggest they should be.

Surely the time has arrived when the large engineering firms in each district should ear-mark one of their leading members to devote some time to public work—not only from self-interest, but from the right perspective of the claims of civic and local government. A greater and keener interest on their part in public affairs would result in less destructive criticism, and tend to efficient management with greater benefit to the community generally, and incidentally to industry and commerce.

Apart, however, from municipal problems, our large towns—Manchester in particular—are more than ever becoming centres for meetings and organizations for the betterment of our social system and life, the furtherance of education and scientific investigations, and the general amelioration of the conditions of mankind. Many of these efforts are retarded, and their scope limited, by the apathy of those who really benefit from the point of view of the general advancement of the city. Not the least valuable lesson of the war was the advantage of co-operation in national matters; and the same energy and concentration of endeavour in local matters would undeniably achieve results beneficial to the whole of the citizens.

Hence my call for a greater intermixing of engineering talent in local administration. Leavened by such talent, good must result. The chief technical advisers of a municipality are their paid engineers; but their capabilities and responsibilities have been very generally under-assessed, as, also, have their power to promote advantage to the community. This under-assessment has, I am afraid, increased since, in some local governing bodies, a new element has come in, and obtained footing and voice. There is no dispute as to the right of the new men to be there; their right is found in their election. But the professional zones of our communal system must supply the counter-active or corrective to the policy of retrogression, which is often erroneously labelled "progression." Paramount should be engineering. But in saying so, this I would emphasize: Engineering does not want to act in local government autocratically, arbitrarily, or coercively, but in all things co-operatively.

This brings me to a phase of the question in connection with which those of us who are identified with engineering firms would like to point out how competent judgment would, in the administrative chamber, assist those who hold positions as official engineers. One of the worst features in our system of local government is that competent official advice and plans in respect of technical matters have to be submitted to technically incompetent administrative determination. The non-existence of qualification for deciding whether a scheme will or will not prove to be of public advantage, has frequently resulted in good schemes, with prospective paying economies or productiveness, being set aside, or so crippled as to have their full efficiency in service sadly depreciated. An official engineer cannot argue the matter in a council chamber. Many of the members would look with a sort of pious horror on even the suggestion of any breach of the time-honoured custom of not allowing their own officials to champion in the sanctum of local administration their own schemes or decisions before a verdict of the governing body is given upon them. I do not, without further consideration, advocate this liberty, although on occasion I see the advantage that would accrue if it were considered the correct thing. The only voices the official engineer has are those of the chairman and members of his committee, who approve of his proposals. If engineering qualification does not exist among them, then, when technical matters are involved, their voices are largely the echoes of that of the engineer, and sometimes indifferent ones at that. They must lack the independence of judgment which trained qualification and experience alone can give.

Therefore, I maintain, the incorporation in municipal bodies of such engineering qualification and experience would be helpful to the official engineer. It would not necessarily guarantee right determination; but it would unquestionably be of assistance in having all sides of a matter thoroughly threshed out, and in contributing to the direction of judgment to a right determination. From all points of view, then, the case is clear for non-official engineering having a larger part in local administration—not only as considerable ratepayers, but as members of a section of the community with abilities of public value and service which they can exercise disinterestedly.

The times are full of matters of local importance that require such men—more especially now that all things (money included) are dearer. We want a larger and more wholesome life for our communities. We want our municipal services to be of the very best, judged by the standards of economy and efficiency. We want them to be most profitable (in the broadest sense of the word) to the community. Realization can only be the product of competency in administration; and in the matter of competency, the engineer cannot rule, but he can and should effectively participate.

THE INDUSTRIAL QUESTION.

Coming to the succeeding part of the address, in which he discussed the industrial question, the point on which Mr. West most concentrated his attention was that of re-establishing the personal touch in industry between employers and employed—this being, in his opinion, a matter that deserves very earnest consideration. He referred to the very useful part that has been performed by Works Committees and by combinations of employers and trade unionists. It is Mr. West's deliberate opinion that not only should a properly established Works Committee deal with questions of specific grievances, comfort of workshop and mess room, benevolent fund, holidays, social activities, and domestic matters, but it should be used by the employer as a means from time to time to acquaint the workpeople as to the position of the order or contract book, the difficulties of competition, and the reasons for the introduction of new methods and machinery. He regards this as highly important and educative; for, as he says, unless the men are cognizant of these matters, the basis for judgment in their case must be defective. Moreover, mutual confidence between employer and men as to the prospects or duration of good trade will do much to banish from the mind of many the spectre of unemployment. There is nothing more fruitful of unrest than a haunting sense of insecurity in the minds of workers.

This is really the text on which Mr. West founded this most interesting part of his address; and he pointed to the large developments of which a Works Committee is capable in the way of bringing an employer and his colleagues into closer and more friendly touch with the trade unionists and enabling them to meet for amicable discussion, as well as to spend social evenings, and arrange visits to works and summer outings.

In his concluding remarks, Mr. West emphasized the fact that no system or development in the nature of Works Committees or other methods will produce efficiency, progress, and happy relationship if the human spirit is wrong. He deprecated the all too frequent disparagement of the British workmen in the press and at public meetings, and expressed the view that further destructive criticism, unless accompanied by a constructive policy, will not be productive of much good.

Mr. W. J. Hartley, the Manager of the Gomersal Gas-Works, has been presented with a gold-mounted walking stick from the employees, on his retiring owing to the transfer of the Company's property to the Spenborough Urban District Council.

Sir Edward A. Brotherton, M.P., has given £20,000 to the University of Leeds for the development of bacteriological study and research, more particularly in the interest of public health. This is stated to be the largest individual gift ever received by the University.

The opening meeting of the new session of the Scottish Junior Gas Association (Western District) is fixed for next Saturday (Oct. 15) evening, in the Royal Technical College, Glasgow, when Mr. James Cubie will deliver his Presidential Address. On the 29th inst., there is to be a visit to the Edinburgh works of Messrs. Parkinson and W. & B. Cowan.

A programme has been arranged by the Royal Institute of Public Health of free lectures and discussions, on Wednesday afternoons, at 4 o'clock, in the lecture theatre of the Institute at No. 37, Russell Square, W.C. The following are the first three lectures of the series: Oct. 19, "Problems of Industrial Hygiene in Relation to Public Health," by Sir Thomas Oliver, M.D., D.Sc., D.C.L., F.R.C.P. Oct. 26, "The Political Significance of Industrial Hygiene," by Mr. R. M. Wilson, M.B., Ch.B. Nov. 2, "The Influence of Atmospheric Conditions on Industrial Efficiency," by H. M. Vernon, M.A., M.D.

SOCIETY OF BRITISH GAS INDUSTRIES.

Annual General Meeting.

THE Annual General Meeting of the Society was held last Wednesday, at the Hotel Cecil, Victoria Embankment, W.C., under the presidency of Sir ARTHUR DUCKHAM, K.C.B. The attendance of members was large and representative of all sections.

MINUTES OF LAST MEETING.

On the suggestion of the PRESIDENT, the minutes of the last meeting were taken as read, and were confirmed.

THE LATE MR. J. H. BALFOUR BROWNE, K.C.

The PRESIDENT said the first duty of the members was one of, certainly, a very unfortunate character for the Society, and one in regard to which they must express their sympathy with all those who were connected with, and who suffered personally from the death of, Mr. Balfour Browne. As all the members knew, he was to have again taken the Presidential Chair at the end of the meeting that day. Mr. Balfour Browne was a friend of most of them, having been their President in previous years; and his loss was an extremely heavy one, because they did always need a friend at the "court" where he was so much *persona grata*. The value of Mr. Balfour Browne to the Society was exceedingly great; and his loss to the members was very heavy. He would ask the members by standing up to pass a resolution of sympathy with his relatives.

In silence the members stood, and so acknowledgment was made and sympathy expressed.

The SECRETARY (Mr. Arthur L. Griffith) said that the last letter he received from Mr. Balfour Browne was written only a few days before he passed away. It showed how much he appreciated the honour of being asked to be the President again this year. The letter was dated Sept. 20, and was as follows:

> My dear Sir,—Would you thank the President and Council of the Society of British Gas Industries for their kind invitation to dinner on the 5th of October.
>
> I am exceedingly sorry that I cannot be in London that day; for I see by the programme of the meeting that a part of the business was the introduction of the new President to the office to which the Council have generously invited me.
>
> Although I cannot be with the Society on the occasion, I hope you will assure the members that I will be pleased to put my services at their disposal, and that I am fully sensible of the honour they have conferred upon me.—I am, yours sincerely,
>
> J. H. BALFOUR BROWNE.

ANNUAL REPORT.

The annual report of the Council was published in the "JOURNAL" for June 29 [p. 732].

Mr. CYRIL G. DAVIS (Chairman of Council) moved its adoption. He remarked that the Society had had a very successful year. The members had had to mourn the loss of many valued friends. He would particularly like to refer to the death of Mr. Thomas Marsh. The Society had suffered a great loss in the departure from their midst of Mr. Marsh. He was one of the founder members of the Society; and they must never forget the excellent work these founder members did when they formed this very successful organization. Passing on they saw that Sir Arthur Duckham, Sir Alfred Keogh, Sir George H. Holcroft, Sir Robert Hadfield, Mr. Fred J. West, Mr. Thomas Duxbury, Mr. Albert Cliff, Mr. George Clark, and Mr. R. J. Milbourne had all had various honours conferred upon them, which was a great compliment to the Society. The members appreciated these honours very much indeed. The Sheffield meeting was an excellent one. Sir Robert Hadfield received them with open arms; and they were entertained at luncheon by him and his fellow Directors. They were shown round the works and all facilities were given them to investigate every part and every nook and corner of the premises. The visit was a great pleasure and, from the educational point of view, a great success. The paper on "Carbonization" submitted by the Society at the last meeting of the Institution of Gas Engineers was very well received; and they had been asked to present a paper at the meeting next week. Among the many other points in the report was the one as to the quarterly "Bulletin," which was started during the year. Thanks to the energy of their Secretary (Mr. Griffith), the "Bulletin" had met with great approval by all the members. It was felt that the members of the Society only met twice a year, and that they would like to know a little more about what was going on in connection with the Society. Therefore it was suggested that a "Bulletin" should be brought out from time to time, so that the members should be *au fait* with all that was going on.

Mr. J. W. BROADHEAD remarked that, as one of the original founders of the Society, and one who had taken a deep interest in it from the very beginning, he had great pleasure in seconding the adoption of the report, which incidentally, he took it, was the Chairman's report approved by the Council. It was some time since he read through it carefully, and so he was not quite conversant with the points he might have dwelt upon. However, he remembered that, when he had finished the reading of the report, his feeling was one of satisfaction with the good work that the Council were doing for the Society and for the gas industry generally. There were three outstanding features in connection with the work of the year. One was the President's Address, entitled "Labour's Position in Industry." The second feature was the fact that the Society's subscription to the British Commercial Gas Association had now been raised to the handsome sum of £5000 per annum, which he was perfectly satisfied would be spent in the very best interests of the industry, and would bring home to a lot of people the use and value of gas for many purposes—more so than anything that had been done in the past. Then the Society were doing very useful work, and was increasing in importance from year to year; and they had every reason to be satisfied with the able Council they had to conduct their affairs. The other thing also outstanding was the "Directory" the Council had set going, which would be put in the hands of gas managers very shortly.

The report was adopted.

Mr. PERCY F. HOLMES moved the adoption of the accounts for the year 1920-21.

Mr. F. J. GOULD seconded the motion, which was carried unanimously.

NEW MEMBERS OF COUNCIL.

The PRESIDENT said he had to announce the names of the gentlemen who had been elected to serve on the Council as representatives of the sections. Before he mentioned them he should like to say that it had been his privilege, during the last year or two, to attend a number of the meetings of the Council. Previously he had never been to one. He had been much impressed by the amount of work the Council did, and the serious way they took upon themselves the functions of their office. The rota for the Council was undoubtedly a good thing, because it gave all the members a chance to do work for the Society; but he did trust that the competition for the Chairmanship of Sections would be very keen in future. It was an honour to be on the Council; and the work was of great interest. He hoped, therefore, the members would feel they should come forward, and let their names be submitted as Chairmen of the Sections. Of course, some men were always willing to go forward, and to do all the work; and others were equally willing to let them do it, so long as they would. He thought they must try to do better than that. The names of the members of Council representing the sections were as follows:

J. Wilfrid Drake	Representing Section	I.
T. Alborn Clapham	,, ,,	II.
Alderman Fred. J. West, C.B.E.	,, ,,	III.
R. J. Milbourne, J.P., F.C.S., A.M.Inst.C.E.	,, ,,	IV.
Albert W. Glover	,, ,,	V.
Charles Clare	,, ,,	VI.
J. Bridger	,, ,,	VII.
T. E. Upjohn	,, ,,	VIII.
John Orme	,, ,,	IX.
Thomas Allen	,, ,,	X.
B. B. Waller, A.M.Inst.C.E.	,, ,,	XI.
Norman Wilton	,, ,,	XII.

During the year, the President continued, there had been several discussions on the question of joining together some of the sections. His friend Mr. Samuel Cutler, jun., had been to some of the Council meetings, and discussed the matter with the members. The Council had not got any further with the question; but they did hope that the sections that could work together would do so in the coming year. He mentioned the sections dealing with retorts and fireclay goods. He thought at any rate these two could work together in the closest community, and with good result.

NEW CHAIRMAN AND VICE-CHAIRMAN OF COUNCIL.

Mr. CYRIL G. DAVIS next moved that Alderman George Clark, J.P., be elected Chairman of Council. He had the greatest pleasure in moving this. Mr. Clark was a man of much administrative experience, and also of local politics. He knew thoroughly well how to handle the Council. He was held in the highest esteem by all the members, and had had considerable experience of the work carried on by the Council.

Mr. B. B. WALLER said he was very glad to have the opportunity of seconding the proposal. Mr. Clark was an old friend of his; and he knew what energy he put into his work, and the interest he took in the Society's business and welfare. He had great confidence in the advantage of his election to the Chairmanship of the Council.

The resolution was cordially agreed to.

Mr. CLARK thanked the members very much for the honour conferred upon him by electing him Chairman of the Council for the ensuing year. He could only say he hoped to be successful; and he was sure he would be so, if he received from the members the same support as his predecessors in the office had done. He had had the pleasure of being on the Council for some years; and the support that was usually given by the members to the Chairman made him hope he might be able to carry out the work at least to their satisfaction. Now it was his duty and pleasure to propose that Mr. Albert Cliff, J.P., be elected Vice-Chairman of the Council. He, too, had had considerable experience of public work in one of the oldest towns in England; and therefore he (Mr. Clark) felt quite sure he would make in the year following a worthy successor to himself in the chair.

Mr. J. BRIDGER had pleasure in seconding the election of Mr. Cliff as Vice-Chairman. He himself was only a new member of the Council; but he had had an opportunity of seeing the important nature of the work that had been, and was being, done. He was sure Mr. Cliff was a most valuable member of the Council; and he had confidence that he would fill the vice-chair in the most able manner, and to the benefit of the Society generally.

The motion was heartily carried.

HONORARY TREASURER AND HONORARY SECRETARY.

Mr. T. V. MILES proposed the election of Mr. H. M. Thornton, J.P., as Hon. Treasurer. They all knew Mr. Thornton; and the more they knew of him, the more they respected him. Therefore, he was sure the members would be unanimous in electing him to the office.

Mr. ALBERT W. GLOVER seconded the motion, which was passed.

Mr. CHARLES CLARE moved that Mr. F. J. Gould be elected Hon. Secretary. He had been on the Council a long time, and had proved himself a very good member of that body. He (Mr. Clare) knew

something of the work that the Hon. Secretary had to do. It might not appear much on paper, but there was a great deal of influence behind it.

Mr. BRIDGER said he had known Mr. Gould for a great number of years, and had the greatest pleasure in seconding the proposal.

The motion was unanimously adopted.

ELECTIVE MEMBERS OF COUNCIL.

Mr. SAMUEL CUTLER, JUN., proposed that Mr. Cyril G. Davis be appointed an elective member of the Council. He remarked that the outgoing Chairman of the Council had naturally a good insight into the details of the work which had been accomplished, and which was in hand. The work Mr. Davis had done recently as Chairman had been of great service both to the Society and to the industry, and his knowledge would be of considerable value if he were elected to the proposed position.

The PRESIDENT said he should like to be allowed, as an ordinary member of the Society, and not as President, to second the motion. Mr. Davis had the unfortunate knack of making other people work; and he had made him (Sir Arthur) work much harder than he had intended to do when he took on the functions of President. The presence of Mr. Davis upon the Council was invaluable, and he (the President) thought that previous Chairmen should be on the Council, because they could be of great assistance to the new Chairman.

The motion was heartily agreed to.

Mr. R. J. MILBOURNE, J.P., proposed the re-election of Mr. Archibald P. Main and Mr. Samuel Cutler, jun., as elective members of the Council. He remarked that these gentlemen were well known to all the members of the Society, and particularly to those who had served on the Council. Mr. Main had in the past occupied the office of Chairman; and he thought he might be allowed to say that he was one of the "main" stays of the Society. Mr. Cutler had also served as Chairman of the Council, and had been Chairman of one of the sections from time to time. For a great deal of the advance which had been made by the Society, they were indebted to Mr. Cutler. He was exceptionally keen; and anything which affected the welfare of the Society had his consideration.

Mr. THOMAS A. BRADDOCK seconded the motion, which was at once agreed to.

Mr. J. WINSON SCOTT proposed the election of Mr. Charles S. Bennett and Mr. F. C. Tilley as elective members of the Council. They all knew the work Mr. Bennett had had to do this year. As Chairman of his section, he had had to deal with a considerable amount of trouble with the Bricklayers' Union; and when they remembered the very able way in which the new arrangement had been made, and was working so satisfactorily, they could not very well afford to lose his services. Mr. Tilley had served excellently as their Hon. Treasurer; and there were other duties connected with the Society with which he had worked hard in order to get them threshed out.

Mr. CLIFF seconded the motion; and it was unanimously agreed to.

RE-ELECTION OF AUDITORS.

Mr. THOMAS GLOVER proposed the re-election of Messrs. Cash, Stone, & Co. as Auditors at the same remuneration as before.

Mr. R. B. HODGSON seconded the motion.

VOTES OF THANKS.

Mr. F. R. SMITH moved, and Mr. C. A. GOODALL seconded, a very hearty vote of thanks to the Council for their services during the past year. Comment was made by both gentlemen on the very strenuous nature of the work the Council had had to deal with; and they thanked them for all they had accomplished.

The resolution was carried with applause.

The PRESIDENT proposed a vote of thanks to the Hon. Treasurer, the Hon. Secretary, and the Secretary, for their services during the year. He said he had a lot of sympathy with the Hon. Treasurer; but he did not know that he could say much about the Hon. Secretary. In the course of his duties as President, he had never had occasion to run into that gentleman; but he had had very much to do with the Secretary. About Mr. Griffith he could not say too much in his favour, nor could he adequately express the gratitude they all felt for the splendid work he had done for them during the past year. All the way through, his work had been absolutely unstinted. He received an honorarium, which was a long word for a very little thing. [Laughter.] But Mr. Griffith did not think of his honorarium, but only of the good of the Society. They were very pleased with their permanent Secretary; and they were also thankful to the Hon. Secretary and the Hon. Treasurer for what they had done.

Mr. MAIN seconded the motion, which was very cordially passed.

PRESIDENTIAL ADDRESS.

The PRESIDENT then proceeded to deliver the following address. He prefaced it by saying that he might ask the members for their tolerance in that he had not been able, simply from physical unfitness, to say all he should like to, or to put it in proper form. But they might take the address as representing a few discursive thoughts on the most important industrial problem that they had before them at the present time. If the members desired to discuss the notes he had made, he should be very pleased.

Gentlemen,—In June, 1920, I delivered to you an address on "The Labour Position in Industry," stating that my reason for so doing was that the general industrial position was by far the most important problem we had then to face. During a time of apparent prosperity we saw and understood the writing on the wall. To-day we see the results of that false prosperity, and are in the trough of an unprecedented industrial depression, the uplift from which is difficult to predict either as to manner or time. All of us have this grave industrial problem ever-present in our daily life; and I therefore make no excuse for endeavouring once again to put before you my thoughts on the situation as it has developed to-day.

The happenings of the last eighteen months have emphasized one fact—the Government and Government Departments have absolutely failed when they have endeavoured to regulate industry or when they have involved themselves in the disputes between the various parties engaged in industry. The Coal Strike, the Housing Schemes, the Employment Exchanges, and Unemployment Doles are all examples of dismal failure. I am not speaking against any Government as such; but I do definitely say that industry can never be controlled or regulated by a fallible bureaucracy. Industry must regulate and control itself. We have seen time after time the failure of the business man in Government service. However successful he may have been in his own business, he loses his way in the maze of political expediencies, and is rendered impotent by the restrictive powers of red tape. Industry must control industry. In bygone days, the employer exploited the employee; in recent years, the employee has exploited the employer. To-day we are all beginning to realize that there must be no top dog of any one class in industry—that all of us are employees working for the good of the industry in which we are concerned, and in this way working for the good of the country at large.

The control of industry must come into the hands of all those engaged in industry. On the one hand, the manager must appreciate and endeavour to alleviate the difficulties of the worker; and, on the other, the worker must appreciate the responsibilities of the manager and endeavour to lighten them. The last eighteen months have made me only more positive that some such scheme as a Parliament of Industry, such as I foreshadowed in my last address to you, is absolutely necessary for the revival of trade in this country and the happiness of its people.

I do not propose to review the present state of industry. It is well known to you. We are all of us, however, inclined to leave the large problem to others, and somewhat selfishly to concentrate on our own particular business. We are perhaps somewhat diffident about tackling the big thing—we do not consider that we are capable; but we all know that the men who have to face these problems are only men like ourselves, and in most instances have considerably less experience to enable them to put forward proper solutions to the problems. It is therefore necessary at this present crisis for us to put our own affairs second, and the affairs of the nation first, to consider the various schemes that are put forward, to criticize them constructively, and to use our influence in the various spheres to which we belong in order to get adopted those that seem best.

I have already dealt with what to me is by far the most important factor in industry—industrial home rule. I will not, therefore, say anything more on that point to-day, but propose to confine the remainder of my address to putting before you a few suggestions as to how industrial conditions might be improved.

REDUCTION IN TAXATION.

I put the reduction of taxation first, because at the present time taxation is cramping all development in industry. It is largely due to the heavy incidence of taxation that trade is in its present state. When borrowing from the bank is necessary in order to pay taxes, taxes are being paid from capital. Business expansion is only possible with the savings made from the profits of industry. If these profits are curtailed by heavy taxation, capital is not forthcoming to increase industry. The profits of an industrial concern are not by any means represented by cash. But the taxation must be met in cash; and in so doing it often happens that working capital is depleted to such an extent that not only is development stopped, but actual retrenchment of existing business is necessary.

The country is sick and cannot bear the enormous burden of taxation. The load must be lightened in order that industrial health may be regained. In what directions can the burden be lightened? Much has been written on this subject, and the very discursiveness of opinion has obscured the real issues. There are certain charges, such as pensions, interest, &c., which in any circumstances must be met; but there are two items of expenditure which should be tackled. The first is the redemption of debt. I do not believe that commercial prosperity can properly revive for from five to ten years. For the next five years there should certainly be no redemption of debt. When industry has revived, revenue will increase and debt redemption can be recommenced. The second item is the Civil Service Estimates. At the present moment a distinguished Committee are considering this subject; and I believe that their deliberations will result in certain cuts in salaries and establishment. But no sufficient curtailment of expenditure is possible unless the general scheme of government is remodelled.

What business concern could be run on the lines of the Government to-day with a Cabinet of twenty? The war showed the impossibility of endeavouring to control a gigantic undertaking by a Committee of over twenty people. It is only possible in this address to give a very general indication of the possibilities of rearrangement. In my view, the main Cabinet should consist of six men at the outside—the Prime Minister and five others. The various departments of State should be brought together into five such groups—viz.: (1) Finance. (2) Foreign Office and Colonies and India. (3) Defence. (4) Home Affairs. (5) Trade. Each of these five groups would have an inner board of control presided over by the Cabinet Minister responsible, and comprised of the parliamentary heads of the departments included in the group. Thus there would be six men controlling the destinies of the

nation, without detailed responsibilities, and yet cognizant of the whole position of affairs. Such a regrouping should eliminate overlapping and greatly curtail staffs.

PRODUCTION.

When I last spoke to you, demand greatly exceeded supply. To-day, the reverse is the case. In June, 1920, prices were very high, money was fictitiously plentiful, and every one was out to get as much as he could for as little effort as possible. To-day there is, practically speaking, no trade in several of the great industries; and there is a slump throughout the whole world. How are we to revive trade? The revival must of necessity be slow, and can only be accomplished by the goodwill of everybody concerned.

We have heard a good deal about the high rates of wages and the necessity for reductions in order to create demand by lowering prices. To my mind the whole of the discussions on wages has been on a wrong basis. The question is not one of high wages or of low wages. It is a question of whether the wages paid have been actually earned by the recipient. The man getting £10 a week and earning £15 is not being highly paid. On the other hand, the man getting 20s. a week and earning 15s. is being overpaid, and is a parasite on industry. In the same way a manager may be getting £5000, and even £10,000 per annum, and still be underpaid; while many men receive such sums without earning them, and are, in turn, parasites on industry. In future we must endeavour to eradicate class distinctions in industry—capital and labour, employer and employee, master and man—and only recognize the producer and the parasite.

The extension of works committees, too, should assist the production problem by promoting better relations between all those who go to make up the industry. In many instances works committees have been formed and have proved most successful. These works committees have a far more beneficial effect on industry than any form of Whitley Council or general trade board. The works committee is a family affair. All concerned benefit directly by its efficiency, and industrial problems are much more capable of solution when considered by such a body. The workmen members realize the responsibilities of the management, and the difficulties of the workers are brought-up and discussed in the most favourable atmosphere.

I look to the general inauguration of works committees as one of the chief means of obtaining low costs of production. Standard wages must, of course, be regulated by general committees as at present; but if works committees exist, and questions of wages and works control are frankly discussed (as they can be) at their meetings, the representatives will attend the general meetings with a much saner viewpoint and with much more likelihood of reaching proper decisions.

UNEMPLOYMENT.

This is perhaps the most difficult industrial problem that has to be faced to-day. A man out of work through no fault of his own, and willing to work, must be looked after by the community. Unemployment insurance is undoubtedly a proper method of dealing with the trouble in the ordinary way. Funds should be built-up in the good years to provide for the lean ones; but to-day we are faced with the problem in so acute a form, and with so little possibility of its being relieved by any immediate improvement in trade, that other means must be taken to meet the situation. Nothing can be worse for any person than to receive week after week, month after month, a dole from the State and to have nothing to do in return for it. On the other hand, shirkers have no incentive to find employment and do good work so long as they can receive a sufficiency from out-of-work pay. I have had instances cited to me where men have received in out-of-work pay approximately the same wages as their fellows who have done a week's work. Nothing could be calculated to have a worse effect on labour conditions. Work must be found for those willing to work; while assistance in kind must be supplied to the dependants of the shirker. On many occasions when unemployment has been rife, national schemes and local improvement schemes have been discussed; but these have been put forward always as a species of charity, and so have failed. The men employed have felt no necessity to work. The fundamental basis of all schemes should be that they are essential for the betterment of the state of the locality, and that they are carried through not under State or local authority management but on an ordinary industrial basis. Many great schemes of improvement have been held-up during the war. Roads, water supply, sewerage, electric and gas supply improvements, all require attention; and money properly spent on these schemes is profitably spent, and will bring in returns in the future. We must abolish the actual payment in cash to unemployed persons for no work done. The principle is basically wrong, and should not be accepted as a palliative. Objections will be raised as to the cost of carrying out such schemes; but it must be remembered that the money spent in unemployment doles is absolutely wasted—that the potential production of the unemployed is lost, and that the *morale* of the worker is undermined.

COAL INDUSTRY.

The coal industry is truly the foundation of the industrial welfare of this country, and much of the present depression is due to the terrible series of misfortunes that have occurred in this industry since the war. One of the greatest mistakes made in the war was the bleeding of our allies by charging outrageous prices for coal. Our allies borrowed money from us to pay for the coal. Our Government took practically all the profits so earned from the mine owners; while the miner, seeing these fictitious profits, naturally wanted to share in the scramble. A Royal Commission sat in the early months of 1919. Some 28,408 questions were asked of various witnesses who had also put in full statements. Reports were submitted to His Majesty; but absolutely no action was taken on such reports. We all know the damage done to this country's trade by the disturbances in the coal industry. We know we cannot run our staple trades unless we have cheap coal nor buy our raw materials and the food stuffs for our industrial millions unless we can export coal. The great coal strike was settled temporarily; but already we hear rumours of further strikes, the shutting-down of mines, and the increase of unemployment in the coal industry. I have stated elsewhere my ideas on the proper organization of the coal industry; and all I need say is that, unless the mine owner and the miner get together—not as separate units but nationally—and evolve a proper inclusive scheme for producing cheap coal, we shall have continued trade depression and, what is worse, a return to the bad old days when starvation forced the miner to work. Many short-sighted people would say "serve them right, they squeezed the consumer when they could." But such a spirit is an entirely harmful spirit. Coal can be produced economically at a reasonable price to the consumer, industrial and domestic, and to our foreign buyers, and at the same time the lowest paid worker can live under proper conditions.

FOREIGN EXCHANGES.

We all realize the hindrance to trade revival presented by the chaos in foreign exchanges. Our best customers cannot buy from us either because their exchange is so low or because their exchange being high we cannot afford to buy from them in return. Foreign trade to be good must be as free as possible. Our previous world position in pre-war days was largely due to the free trade policy that it was then possible to follow. Now we are absolutely hemmed-in by financial and political difficulties. I believe that it was Mr. Stetinius (of Messrs. J. P. Morgan and Co.) who, immediately after the armistice, recommended the cancellation of all war indebtedness between the allies. No one was in a better position than he was to make such a recommendation; and if it had been carried out, we might have been spared much that we are suffering from now. We would all like to see Germany pay for the sufferings she has caused; but the action that has been taken by the allies seems solely to have resulted in depreciating the mark, and so making the export of goods by Great Britain to Germany almost impossible, while allowing Germany to be an almost irresistible competitor of our home products throughout the world. All I would suggest in this direction is that the best advice be obtained as to how the problem of exchanges can be met for the general good of world commerce, and then that action be taken.

DISCUSSION.

Mr. ARCHIBALD P. MAIN said he was sure the members would like to acknowledge their indebtedness to the President for bringing before them the great fundamental questions of unemployment and the organization of industry. He must confess, however, that he was somewhat surprised that, with his wide outlook, Sir Arthur did not mention what might appear to be a most important element in the problem—that of emigration. He (Mr. Main) did not often agree with Lord Northcliffe; but he had rendered great service to one of the colonies by pointing out the necessity of filling Australia with British blood. He had pointed out that it was an unthinkable thing that a country as big as the whole of Europe should dream of being contented with a population less than that of London—some 5 millions or so. There they had a wonderful outlook. Lord Northcliffe had suggested that the British Government should pay part of the cost, or share the cost with the Australian Government of emigration from home; and by this means relieve some of the pressure here, and yet do good to Australia. He (Mr. Main) believed that one of the questions this country would soon be up-against was the pressure of the population against the means of subsistence. They could not go on for ever in such a small island as this, with a population getting on to 50 millions (and which might in a short time be 60 millions), without serious effect upon the nation. Further Sir Arthur had not referred to the great injustice done to limited companies by the imposition of a special tax. This was most unfair as compared with private individuals in trade; and it would not in the end be of any benefit to the State. The question of exchanges puzzled everybody. He was speaking a few days ago to a man who was extremely well known, and had made an immense fortune; and he (Mr. Main) asked him what he thought about the question of exchange. He said: "Well, my advice to everybody would be this: Do not worry about the exchange. I will tell you why. Because there is nobody who understands the problem. It is something beyond our conception. We do not know what is at the bottom of it; and all we can do is to watch and see what is going to emerge." Sir Arthur had always distinguished himself by his regard and consideration for the workers in industry. For his lucid and helpful address, the members were all much indebted to him.

Mr. C. S. SHAPLEY (Leeds Corporation Gas Engineer) said he had listened with great interest to Sir Arthur Duckham's address, and particularly to his remarks regarding the rate of exchange. He (Mr. Shapley) had recently returned from Germany; and he was struck by the prosperity of at least one large town he visited, which had some 150,000 inhabitants. There appeared to be a good deal of liveliness about the streets, and everything seemed to be going on as usual. A large iron-works that he visited, employing 4500 men, were working six days a week, and twenty-four hours a day. This, he thought, would be of some interest to the members, because, when one heard, as he did (being on the other side of the fence), about short time in

factories, it was rather refreshing to learn that, in spite of the adverse rate of exchange, the German factories were working twenty-four hours a day and six days a week. From his own observation, he could say that the men went about their work with enthusiasm. In Germany, they were gradually coming back to pre-war ideas as to work; and the men were being paid less wages than Englishmen. The wages in this particular factory were 13·50 marks for an eight-hour day.

Mr. T. GLOVER said that, like the previous speakers, he had listened with absorbing interest to the remarks of Sir Arthur Duckham, and he wished to add his tribute to what had been said about the value of the address. The President had covered an extraordinarily wide field; and some of the topics he had put before them—such as the constitution of the Cabinet—were perhaps on a level a little higher than some of the heads of the members. Personally he should not endeavour to follow Sir Arthur there, excepting to say this, without attempting to criticize any Government Department, if they considered the type of men who had, within (say) the last fifteen years, somehow or other managed to get into office and authority, it was a perfect marvel that the country was not worse off. One thing he missed from the address was the note of optimism which one usually associated with Sir Arthur. Personally, from the inquiries he could make in his own small sphere, he could not help thinking they were perhaps rather closer to a revival of trade than would possibly appear from the address. As the members all knew, they were just on the verge of a wages settlement in the engineering trades, which in all probability would come along rather sooner, and with less friction, than had been generally anticipated. If they got through the next month or two without any more serious disturbances, they would, he believed, see a great revival of trade perhaps earlier than most of them thought. The President had touched on so many topics that one could not attempt to follow them all; but he did mention one or two things which they might perhaps with profit talk about a little more. He believed that in one place the President had referred to the questions of rates of wages, works committees, and so on. But he (Mr. Glover) could not help feeling—he thought when Sir Arthur Duckham's address was discussed last year this subject was mentioned—all these industrial troubles were due to the lack of close personal contact between the heads of firms and the workers, down to perhaps the smallest boy in the shops. In these days, the sizes of industrial undertakings were constantly increasing; and it was therefore perhaps a little difficult to keep that touch with the men which was so very necessary and so highly advantageous. But if they were to make an effort in two directions—to carry on their business in the same way as they were taught to play football, and not to think so much of the interests of the undertaking and of the trade, it would be far more hopeful, and a more human touch would be established between those connected with the management and those who were working as their employees. If, as Sir Arthur had indicated, some distinction was drawn not between the employer and the employed, but between the workers and the parasites, then they would get along rather faster than some of them anticipated.

Mr. J. W. BROADHEAD said Sir Arthur was one of the first men to expound the view that the state of the trade of the world would not improve until all Governments had scrapped their loans. At one time, he totally disagreed with him in this; and his personal view then was that Germany ought to be made to pay. He agreed to-day that, if the Allies decided to scrap the loans, and call "quits," that was the principal step which would bring back the exchanges of the world. Until exchange improved, trade would not recover as they hoped it would do. At the same time, he thought Sir Arthur was too much pessimistic when he talked of revival requiring five to ten years. If this was so, it would be a bad job for England. The chief point he (Mr. Broadhead) had in mind was this: He should like to impress upon the President of the Council whether it was not possible to expedite the ways of the Ministry of Health in granting loans for extensions. There was no doubt about it—it was all a matter of form, and nothing else; and to-day the Ministry took months and months before they would grant a loan. His firm had a certain contract given to them early this year, subject to the sanction of the Ministry of Health. They had taken the work; and in the ordinary way it should be in time to give considerable employment during the coming winter. But the Ministry of Health had not yet held the inquiry. There was the work waiting to be done; the firm were willing to do it; but it was being held-up.

Mr. SAMUEL CUTLER, JUN., said he should like to ask Mr. Broadhead who he expected would pay for the war debts when they were cancelled. If the debts were cancelled, the War Loan would also have to be cancelled; and the War Loan was in the hands of individuals constituting the British public. He did not think that the suggestion came within the range of practical politics.

Mr. R. J. MILBOURNE said he should also like to make the point of whether the Society could not do something to expedite the Ministry of Health in holding inquiries in respect of the various loans for work going on, or which could be taken up, in connection with municipal gas undertakings. He had a case in point in which an order was placed subject to the sanction of the Ministry. Some six or seven months passed before the Ministry gave notice of the inquiry. When the inquiry was held, it only occupied about an hour. But, even then, it took another month or two before the sanction got through to the Local Authority. Therefore, the work was held-up all that time; and he believed the gas industry could at the present time show a number of similar cases. If the Ministry of Health could be induced to expedite their inquiries, it would certainly tend to improve trade, so far as the heavy section of the Society was concerned.

Mr. CYRIL G. DAVIS proposed a vote of thanks to Sir Arthur Duckham for his address, and for the service he had rendered to the Society as its President. Sir Arthur had the knack of putting his points forward in a very practical manner. He (Mr. Davis) remembered his paper on the "Labour Position in Industry" in Sheffield last year; and he was impressed with the practical and successful manner in which he put forward his solution of the labour difficulties at that particular time. His address that afternoon had brought forth during the discussion many excellent suggestions. While he had been sitting there listening to the discussion, he had heard Sir Arthur say: "That is a good idea." This showed that his address really brought out points which might be of great value not only to the Society, but to the whole of the gas industry. The one particular point he (Mr. Davis) had in his mind was the question of raising money. Money was the most important factor to-day and every day; and anything they could do to get money to increase business, so much the better for them and for everybody else. He desired to propose a hearty vote of thanks to Sir Arthur for the able way he had occupied the Presidential chair during his year of office. He did not want to make comparisons, but he was sure they never had a President who had worked so hard for the interests of the Society as Sir Arthur had done. He had been at most of the Council meetings; and his assistance had been of great value. It was particularly fortunate for the members that they had had a man to act as their President who knew so much of their difficulties, and who was one of them.

Alderman GEORGE CLARK said he desired to associate himself with all that Mr. Davis had said concerning the President. He was a man with a big view, with a great personality, and with that driving force behind him which got things done. Those of them who had watched his career during the war were not surprised at the tremendous influence he wielded in the Government Departments in which he worked. His magnetic personality made itself felt, and that personality had been also felt in the Society during the past year. He was a practical man. He understood their business and wants, and he had tried to lift them out of the rut into which they might have fallen, by putting before them these larger questions. He (Alderman Clark) was not going to speak on the address, because every word of it was worth reading again, and every paragraph would almost make a paper in itself. One thing that occurred to him was the question of employment. He felt very convinced that if the industrial leaders of the country would take a greater interest in local government, they would produce better results. When one got into the work, one often got sick to death of it—sick to death of the pulling and the striving of the labour elements, who were out for position, and out to work their local authorities as they thought fit. This would not occur if the employers of labour in this country in their respective localities took a real live interest in the Government of their towns. To-day the country was governed too much in Parliament by lawyers. They wanted business men there; and they wanted men who had influence on their public bodies. Something had been said as to how they could expedite the sanction of the Ministry of Health to the various schemes that were coming forward. Speaking from his own experience, he said that if they wanted anything from the Ministry they must go for it. If they had a live town clerk, and a live council, they could get their schemes through pretty quickly. When letters were sent up to the Ministry, they got on to a file. If they did not have a reply, and went to the Ministry (as he had done somewhat frequently), they would probably find their letter at the bottom of the file; and it was only by growling that they could get it brought to the top, and obtain a reply. He had been on more than one occasion to the Ministry of Health, and had got a promise that a letter should follow in a few days, and consent be given to the application. Sir Arthur had spoken of work for the unemployed. It was this work that they as contractors wanted; and they wished to get the money for their municipalities to carry out practical schemes. If they were going on much longer with the unemployment dole, they would destroy the whole *morale* of this country. He desired to agree very cordially with Mr. Davis in the resolution he had put before the meeting, and had much pleasure in seconding it.

The resolution was carried by acclamation.

The PRESIDENT said he did not know how to thank the members for their kind appreciation of whatever he had been able to do for the Society. It had been an extremely interesting time to him to be their President. He had felt the honour so much, because he was the first President to be elected from among the members. This was an honour he should carry with him through life. With regard to the address, he was afraid he had sprung a good many things on the members. He had sprung them on himself from time to time. He should have liked to have put them in smoother form for the members. At times he rather believed in abrupt statements. They made one think, and secured action being taken. He was glad the address had produced discussion. He thought Mr. Main's point as to emigration was an excellent one. They could not support the population in this country. Some of the population must go out of the country; and the colonies were the places for the people to go to. He thought Lord Northcliffe was proposing something beneficial to the industrial situation in this country by advising emigration. Moreover, so long as there was over-population, there must be C3 children growing-up, while the birth-rate of A1 children was going-down. He did not think any of them would grudge the growth of the power and might of their colonies at the expense of the Mother country. He was with Mr. Main in that. The only hitch was the industrial condition—particularly the condition in respect of money—which was as bad in the colonies as here. However, unless they made up their minds they were going to solve this trouble properly instead of by doles, there might be some difficulty. He would rather spend three times as much money on useful work. With regard to the sanction of loans, he certainly thought action should be taken with the Ministry of Health, and the fact be pointed out how much more employment there could be if loans were sanctioned quickly. Mr. Broadhead, Mr. Milbourne, and himself had seen cases where work had been held up by the slowness of Government offices. He thought they as a Society could take action; and he would suggest to the Council that the question as to the necessity for granting loans more quickly should be brought before the Ministry. He hoped they would have a distinguished gentleman at dinner that evening who had the ear of the politicians; and he (Sir Arthur) would do his best to see what could be done. As to the matter raised by Mr. Cutler of the cancellation of debts, this country's debt to America was practically the same as the total debt of the Allies to this country. He would not say anything about Russia. But the point about the cancellation of debt was that the country that had lent the most money would have to assume the debt as a national debt, and as not repaid, or else fund it. He was certain that if the war indebtedness were cancelled, the country would have greater prosperity, and better trade conditions would be secured. In conclusion, he could only regret this was the last time he should be standing before the members as President of the Society.

A NEW HONORARY MEMBER.

On the motion of Mr. DAVIS, seconded by Mr. HOLMES, Sir Arthur Duckham was elected an honorary member of the Society.

The PRESIDENT thanked the members for this mark of their appreciation.

This concluded the business proceedings.

A DINNER AND SOME SPEECHES.

In the evening, the members dined together. Sir ARTHUR DUCKHAM was in the chair. Among the guests were Lord Riddell of Walton Heath, Mr. D. Milne Watson (President of the National Gas Council), Mr. Thomas Goulden (President of the Institution of Gas Engineers), Mr. Thomas Hardie (Senior Vice-President of the Institution), Mr. F. W. Goodenough, Mr. Jacques Abady, and Mr. H. E. Bloor. The acceptances numbered about ninety. After dinner there were speeches interspersed by some songs by special artistes.

WORK OF THE GAS INDUSTRY.

Lord RIDDELL, in a happy speech, proposed the toast of the "Society of British Gas Industries." He pointed out that everything seemed to be in a state of solution at the present time; but there was one thing that always marched forward. That was science. There was no retrograde movement in science. There was a clear chain stretching back to the Greeks; and all scientific men, true to their principles, were always moving forward and discovering more—always engaged in some investigations with the view to subordinating the forces of Nature to the uses of man. In these trying and changing times, to be able to look at one phase of human activity which was always progressing entitled those engaged in such pursuits to consider the position with the greatest satisfaction. He could not say much about gas. He used a certain amount of it, and found it at present extremely expensive. He spoke of his sincere admiration for the gas industry in regard to its work during war time, notwithstanding the "bad" quality of gas which resulted. The country were much indebted to the industry for the remarkable skill that had been brought to bear upon the difficult problems with which its technical men had to deal. He knew sufficient of the business to be aware that they were engaged not merely on the production of gas, but all sorts of other valuable things allied with gas; and even the most ignorant person must be aware that the industrial future of the world depended in no small measure upon the adequate and proper utilization of coal. It was to the gas engineer that they had to look for development in this matter. The fact was that coal was seriously wasted; and the public looked to gas engineers to improve this state of affairs. He thought a great deal was to be done in this respect. He felt very strongly and sincerely that the progress of the world depended upon the men who carried on the great industries—the gas industry, for example. So far as this country was concerned, he was afraid they were not given to advertising themselves sufficiently. Great Britain was the home of gas making and discovery; and in every branch of science this country stood at the top. There was no country like it. He desired to couple with the toast the name of his friend, Sir Arthur Duckham. But before he sat down, he wished to say what a grief it was to him to see the announcement of the death of his old and valued friend, Mr. Balfour Browne. He was a brilliant man, with a remarkable natural capacity. The extent of his knowledge and ability was not perhaps so fully appreciated as it might have been. He did not mean as Counsel, for in his profession he was eminent and successful; but in other respects he was also really a great man. To him (Lord Riddell) it was a matter of sincere regret that Mr. Balfour Browne was not present to take his place as President that night. ["Hear, hear," and applause.]

THE INDUSTRY'S DUTY.

The PRESIDENT, in the course of his reply, said the members all appreciated Lord Riddell's kindness in coming there that night. They were honoured by his presence. He (the President) especially appreciated it as he had knowledge of the friendship and advice of his Lordship in many times of difficulty during the war. That afternoon he (the President) had been accused of being a pessimist. He had never before been accused of that. But he could not help feeling that now the country was in a period of crisis even more serious for it than was March, 1918. Unless the people of the country all pulled together, it would take them many years to recover. At the same time he looked forward to a very great future for the country. As a gas industry, they had a duty to perform which was always before them—that duty was fuel conservation. On fuel the whole prosperity of the country was based. It was the bedrock upon which industry was built; and unless the fuel situation of the country was put right now, its recovery must be infinitely slow. It was the clear duty of the members of the Society, and the duty of the other side of the industry (some eminent representatives of which were present), to tackle the fuel position; and what they had to do was to see that every step was taken, and that all that was worthy of execution was carried into effect, in order to improve the fuel conditions of the country. What the members had to do was to ascertain how they could supply plant and gas-consuming appliances to the sellers of gas which would enable them to distribute cheap gaseous fuel to the community, because, looking at the matter from every point of view, the ideal heat units to give to the users were in gaseous fuel. They might talk of semi-coke and oil; but the fuel that would improve the health of the country, and at the same time relieve labour, was undoubtedly gas. Unless they could by co-operative action bring about cheap gaseous fuel, it would be a bad thing for the country as well as for the industry. The members of the Society were thinking of it; and he did hope that they would get into closer touch with the gas-making industry during the coming year. They had that afternoon been discussing unemployment. There was much necessary work in the gas industry that had been hung-up during the war; and he was certain that at least half a million pounds sterling of municipal work was being retarded by the dilatoriness of a Government department in granting loans for carrying it out. He (the President) felt certain that, if this was put before the Government, it would have a good effect; and Lord Riddell agreed that they should see Sir Alfred Mond and try to urge on this work. There was need for large improvements; and work that came into their hands, and so into the hands of their workpeople at reasonable prices, would provide labour, and thus help to prevent and ease the problem of unemployment. His opinion was that the Society should take strong action in this matter.

Mr. CYRIL G. DAVIS proposed the toast of "The Vice-Presidents." He remarked that, looking through the list of men who had been Presidents of the Society—men eminent in science, law, engineering, and various other spheres, he could not help feeling that the Society had been very fortunate in having had at its head such illustrious men. He thought great credit was due to Sir Dugald Clerk for accepting the office of President in the now far-off days, because then there was a certain doubt in some quarters as to the advisability of forming a Society connected with the industrial side of the business. Of course, years ago men had not perhaps the same broad outlook as they had to-day. But since the formation of the Society, it had been an unqualified success, having been formed with a proper constitution and with right aims and objects. So far as the members were concerned, it was their intention to keep it on the high plane at which it had always been. In the list of Vice-Presidents, he saw the name of Mr. Charles Clare, who was one of the founders of the Society and was Chairman of the Council the first four years. A great deal of credit was due to him for the straight course on which he steered the ship during those early years, and which course had been kept right up to to-day. He (Mr. Davis) felt that he ought to touch upon the death of Mr. Balfour Browne. It was with very real grief that they heard of his loss; for they realized what a staunch friend they had had in him. The Society had had difficulties of a legal nature; and they knew how very glad Mr. Balfour Browne was to render them help and advice. They had anticipated having Sir Robert Hadfield with them that night; but he had written to say that unfortunately he could not be present. But their President this evening was now actually a Vice-President; and so they would couple with the toast the name of Sir Arthur.

The PRESIDENT, in reply, said he had had two years in the office of President; and so he could speak feelingly for the other Vice-Presidents. The office of President of the Society was more or less a figure-head one. The real work was done by the Council and the Chairman. The Society were to be congratulated on the Chairmen they had had, as well as upon the Chairman they had elected for the ensuing year. Speaking for all the Vice-Presidents, he could say that their great wish was the growth and betterment of the Society; they wanted to feel prouder every year of being Vice-Presidents of it. He would emphasize this, that the Society was a very live thing. It was not only the Council but the sectional meetings that mattered. There were sections that did not meet often enough, and that did not give their representatives on the Council sufficient material with which to go to the meetings. The Vice-Presidents looked for further improvement in the Society through more team work.

GOLF CUP.

The PRESIDENT next handed to Mr. G. H. Pearson Perry the golf cup presented by Mr. H. M. Thornton.

THE VISITORS.

Alderman GEORGE CLARK said he was privileged in having to propose the toast of "The Visitors;" and he had to couple with it the names of Mr. D. Milne Watson, the President of the National Gas Council, and Mr. T. Goulden, the President of the Institution of Gas Engineers. Mr. Milne Watson was now practically the head of the gas industry of this country, and successor of a great man who was formerly one of the Presidents of the Society, and one whom they all respected. The members were pleased to have present these representatives (including Mr. Bloor) of the gas undertakings of the country. The members of the Society represented a large part of the gas industry. The work of the manufacturers' research departments and drawing-offices, and the technical skill in their works, had helped to make the gas industry the success it was. They were glad that Mr. Milne Watson, Mr. Goulden, and others had come among them in their festive moments (if not in their periods of work) to show sympathy and encouragement to the Society. The members considered that in the future all parts of the industry had to pull together, if the industry was to be the success it deserved to be. The President had spoken of the conservation of fuel; but he had not told them of the valuable work he had himself been doing to make gas a success. On the commercial side, Mr. Goodenough had been a pioneer. He had done magnificent work, and had helped the industry to be appreciated more than ever before. Fortunately, the gas industry had had to come down to business; and it had had to realize that it was out to sell something.

MUTUAL HELP IN PROVIDING CHEAP AND SUITABLE GAS.

Mr. MILNE WATSON, in reply, said it was a great pleasure indeed to find himself there that night, in order to testify to the appreciation by the gas companies and gas-supplying local authorities of the work done by the gentlemen who belonged to the Society. He knew that it was sometimes suggested that there was antagonism between the two bodies; but, to his mind, there was nothing really antagonistic in their position *vis-à-vis*. It was of necessity the case that sometimes the members of the Society were on one side of the table and the representatives of gas undertakings on the other, and each side tried to do the best from its point of view. But there was no earthly reason why they should not be friendly, or why they should feel any antagonism towards one another. He did hope that they would realize that they were working together for a common end and a common object. He felt this very strongly. As gas suppliers, they were dependent upon the manufacturers for the apparatus with which gas was made; and their success as gas suppliers depended upon the success of the members of the Society as makers of gas apparatus. So he knew they must work side by side. What was good for gas undertakings was good for the manufacturers, and what was good for the manufacturers would ultimately be good for the gas undertakings. He was not one of those who had any doubt as to the future of the gas industry. If it was necessary to prove this, the war had done so. The

war had proved that, without the gas industry, this would have been, in Lord Moulton's words, a beaten nation within a few months. And the gas industry in these days of peace was as important to the nation as in the days of war. Those of the members who had the privilege of being in Glasgow would realize from what happened there that there were two great objects before the gas industry, apart altogether from the mere business point of view. Naturally, the business point of view was of importance, but that was not the thing which required emphasis at the moment. They were out to make life less of a tragedy for the great masses of the people, and to make cities cleaner and better places to live in. They could not get away from industrialism in this country; but let them have their cities and towns clean, and within them as much fresh air as they possibly could. The gas industry could do this. It could bring into greater efficient play more of the sunshine that had been lost, and it could bring back fresh air. To abolish dirt and disease was the mission of the industry; and the policy to-day was to supply the best gas. By this he meant suitable gas at the lowest possible price. This was the work they had set themselves to accomplish; and it was work the Gas Regulation Act would enable them to perform. But the gas undertakings wanted the assistance of the manufacturers to make suitable gas at a cheap rate, and to enable its utilization with the highest efficiency. Looking round the tables, he was sure their friends on the manufacturing side would not lack in helping the gas undertakings forward in their objects. He thanked the members most heartily for inviting him and the other visitors that night. To them it had been a great pleasure to be present.

FRUITS OF CO-OPERATION.

Mr. GOULDEN thanked the members for the pleasure they had given him in inviting him to be present on this occasion. To him it was simply coming among old friends. He had had a long career in the gas industry; and he had always recognized the advantage of close co-operation between the manufacturing engineer and the gas-making engineer. One of his very oldest friends in gas, and one with whom he first worked, was John West. When first he (Mr. Goulden) went to Beckton, John West was engaged there in the strenuous effort to make stoking-machines work in No. 1 retort-house; and, as in nearly everything he took up, he was successful. He was a great mechanical genius. He was able to put his ideas in the form of a very successful machine; and now, in collaboration with a gas maker, he had evolved a very clever retort. There were other instances of notable co-operation. The Fiddes-Aldridge machine was the outcome of the close co-operation of the gas-making engineer and the mechanical engineer. There was also the Arrol-Foulis machine. These were instances of the successful outcome of the co-operation of the gas maker and the gas-plant manufacturer. He was glad to have it impressed upon them that they should have this co-operation between the two branches. He was glad to bear testimony to the help he had had from the manufacturing side; and he thoroughly realized it. He was speaking now as representing the Institution of Gas Engineers. There was not a gas engineer in the kingdom who did not fully welcome, and was prepared to co-operate in, the work of developing plant and appliances which would enable gas undertakings to give the cheapest possible gas to the community. It was a very pleasing thing to be in a business which had such beneficial objects in view as those referred to by Mr. Milne Watson. And they could go forward thoroughly convinced in their own minds that the more successful they were in the conduct of their business, the better the service they would be rendering to the community. The gas industry had a great chance now. It was starting under new conditions through the Gas Regulation Act, which was due in large measure to the splendid work of their friend Mr. Milne Watson; and with the decisions of the Committees in regard to inerts and carbon monoxide, they were free from restrictions that might have gone far to render nugatory the benefits of the Gas Regulation Act.

With this speech, the toast list ended. There was more music; and soon afterwards a very pleasant evening ended.

PEAT CARBONIZATION IN VERTICAL RETORTS.

A Fuel Research Board Report.

THE results of an investigation undertaken by the Fuel Research Board into the utilization of machine-won peat are given in Technical Paper No. 4, entitled the "Carbonization of Peat in Vertical Gas-Retorts," which has just been issued by the Board, and is published by H.M. Stationery Office, Imperial House, Kingsway, W.C., at the price of 6d. net. In 1920, 100 tons of macerated and air-dried peat was despatched from Turraun to the Fuel Research Station; and what are recorded are the first series of experiments on the carbonization of this peat in vertical retorts with steaming. As other supplies of peat become available, this line of research will be further developed.

The peat referred to in the report was in hard blocks, about 10 in. long, with a cross section of about 2 in. square. These blocks could be sawn and cut like hard wood. On arrival the water content was about 25 p.ct.; but by the date of the experiments, this had been reduced, through storage under cover, to 17 p.ct. Not only do these peat blocks lend themselves admirably, after passing through the coal-crusher, to carbonization in vertical retorts at temperatures between 750° and 850° C., but also in steel retorts at between 550° and 600° C.; and the resultant charcoal is an ideal fuel for suction gas producers.

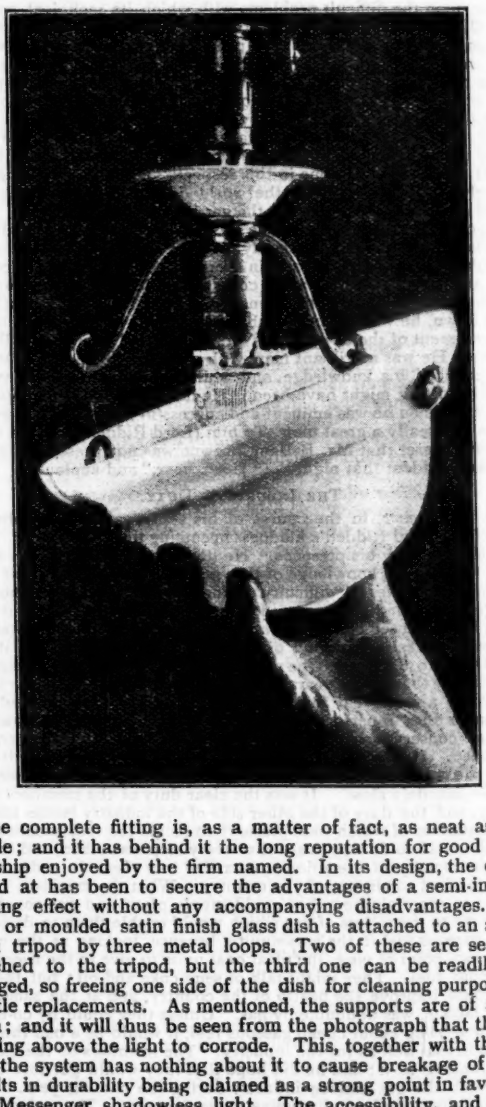
Carbonization at the Fuel Research Station was first carried out at a temperature of 1000° C.; all four retorts of the setting being in use. A throughput of 3 tons per retort per day was aimed at; and a quantity of steam was supplied to the base of the retorts sufficient merely to quench the coke before it was extracted. It was found that 6 p.ct. of steam by weight of the peat carbonized was enough for this purpose. The retorts were heated in quite a satisfactory manner by part of the gas produced during the tests; the amount required being about one-third of the total make. The second test, at 800° to 900° C., was carried out on two retorts only. The same rate of carbonization was employed, giving a total throughput of 6 tons per day.

Owing to its high CO_2 content, the peat gas was very dense, but burned with a satisfactory flame, though with only slight luminosity. A feature of the gas was the heavy sickly odour which it gave out on combustion. An attempt was made to scrub-out condensable gases; but this was rendered rather difficult by the high CO_2 content. A quantity of light spirit was, however, collected in this manner, equal to 1 gallon per 7000 c.ft. of gas, or nearly 2 gallons per ton of peat. Owing to the limited supply of peat, the tests were necessarily of short duration; No. 1 lasting only eighteen hours. No. 2 was made to cover a longer period by operating only the two retorts.

Tables accompanying the report show that the yield of gas per ton of peat was in No. 1 test 14,900 c.ft.; and in No. 2 test, 13,760 c.ft. The gross calorific value was 325 B.Th.U. and 340 B.Th.U. respectively. The charcoal was about 27 p.ct. in weight of the peat; the dry tar per ton of peat was 12·6 gallons and 21·3 gallons; and the liquor per ton of peat, 95·5 gallons and 87·5 gallons—strength 3·6 oz. and 3·3 oz. The peat tar, after separation and cooling, was a thick semi-solid mass containing a high percentage of paraffin wax and less than 5 p.ct. of liquor.

MESSENGER'S SHADOWLESS BURNER.

THERE are various attractive features possessed by a new patent shadowless inverted incandescent gas light that is being placed upon the market by Messrs. Messenger and Sons, of No. 19, Broad Street, Birmingham; and not least among them is its appearance, which the accompanying illustration shows to be much in its favour.



The complete fitting is, as a matter of fact, as neat as it is simple; and it has behind it the long reputation for good workmanship enjoyed by the firm named. In its design, the object aimed at has been to secure the advantages of a semi-indirect lighting effect without any accompanying disadvantages. The opal or moulded satin finish glass dish is attached to an aluminium tripod by three metal loops. Two of these are securely attached to the tripod, but the third one can be readily disengaged, so freeing one side of the dish for cleaning purposes or mantle replacements. As mentioned, the supports are of aluminium; and it will thus be seen from the photograph that there is nothing above the light to corrode. This, together with the fact that the system has nothing about it to cause breakage of glass, results in durability being claimed as a strong point in favour of the Messenger shadowless light. The accessibility, and therefore convenience, of the burner has already been commented upon.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Autumn Meeting at Whitley Bay.

THE Autumn Meeting of the Association was held on Thursday last, at the Waverley Café, Whitley Bay, Northumberland, when Mr. F. C. WILLIS, of Tynemouth, presided over a large attendance.

Several letters of apology for absence were read from officers of kindred Associations and from members of the North of England Association. Mr. W. Doig Gibb intimated that he very much regretted not being able to attend the meeting to hear the address of the President, as Mr. Willis had served under him when he was at Newcastle.

NEW MEMBERS.

The election of the following new members was announced; Mr. G. W. Martin, Houghton-le-Spring; Mr. T. W. Barrett, Bridlington; Mr. A. C. Harvey, Washington, Durham.

Mr. WILLIS then delivered the following

PRESIDENTIAL ADDRESS.

It is rather a curious coincidence that while our Past President last year recorded the fact that 32 years had elapsed between the visits of this Association to West Hartlepool, I find it is just 31 years since the Company I have the honour to serve received the benefit of a visit from the members. On that occasion my respected predecessor (the late Mr. William Hardie) occupied the chair; and while I cannot speak from actual knowledge—being then too young to be eligible for election as a member of the Association, or even for admittance into the ranks of the profession—I have no doubt the visit would carry with it some pleasant memories. Since that distant date vast development has taken place in that portion of the gas industry served by members of the Association, as was clearly shown in the able address to which you listened a year ago; and this equally applies to the majority of the undertakings throughout the kingdom.

From a perusal of the Board of Trade returns, I find that the total recorded production of town's gas for the United Kingdom during the year 1890 amounted to 103,011,039,000 c.ft., whereas during 1919 (the last available year) the total reached the enormous figure of 249,566,414,000 c.ft., or an increase of 142 p.ct. The Tynemouth Gas Company in the year 1890 carbonized 18,760 tons of coal, and produced from it 191,423,000 c.ft. of gas; whereas during last year the quantity of coal carbonized amounted to 56,800 tons, from which we produced 697,708,000 c.ft. of gas—showing on the volumetric comparison an increase of 264 p.ct. during the thirty-year period under review, a percentage increase which makes an interesting comparison with that of the Board of Trade totals.

The gradual development of the Tynemouth Gas Company's business is shown by the following figures, which appear in the "Handbook" now circulated, and which I repeat here for the purpose of illustration:

Year.	Total Annual Make of Gas. Cubic Feet.	Per Cent. Increase.	Maximum Daily Winter Output. Cubic Feet.	Per Cent. Increase.	Minimum Daily Summer Output. Cubic Feet.	Per Cent. Increase.
1870 .	74,052,000	—	346,000	—	82,000	—
1880 .	125,924,000	70	625,000	80	125,000	52*
1890 .	191,423,000	52	907,000	45	217,000	73
1900 .	335,248,000	75	1,614,000	78	511,000	135
1910 .	512,663,000	53	2,211,000	37	878,000	72
1920 .	697,708,000	36	2,721,000	23	1,371,000	56*

* Note increase in minimum daily summer output from one-fifth to one-half maximum daily winter output.

The Company's works as they existed in 1890 were, to a large extent, from the designs of the late Sir George Livesey, and had been in use since 1871. About ten years later, a complete new unit of carbonizing and purifying plant was erected to the designs and under the supervision of the Company's engineers, and was fully described in the interesting paper read by Mr. Clement Hovey to the Association in the year 1903. Since that date the new plant has worked continuously; and the constantly increasing output of gas has brought the retort-house and purifying plant more and more up to their maximum capacity, until we have during the past few years found it somewhat a problem to get the requirements of our district served with the plant available.

The more recent developments consist chiefly in the reconstruction of the No. 1 (or Livesey) Section Works, but also include some important additions to the No. 2 Section Works.

INDUSTRIAL OUTLOOK.

This is, I believe, the third presidential address you have listened to since the termination of the war, or I should more correctly say the cessation of hostilities, seeing that Aug. 31, 1921, has recently been defined by an Order in Council as the official termination of the war. More than seven years have passed away since that momentous 4th day of August which has done so much to alter our destiny and remould almost everything that goes to form any part of our existence.

Terrible as were the experiences of war which no one could foretell, there are few who realized what was to follow Armistice Day, and the very trying experiences that have quickly succeeded one another during the three intervening years. We have been told in the words of the poet that "things like these must be after a famous victory;" but there are those who will no doubt agree with me when I say that so much uncertainty and unrest need not have been the necessary corollary to the re-organization and re-establishment of our national and industrial existence, but rather that had there been a better spirit abroad—a spirit of mutual give-and-take and a little less display of selfishness on all sides—our trade and commerce, our industry, and our so-called labour troubles might have been much less severe and protracted than has unfortunately been the case since the armistice and for some time prior to that date.

Naturally this view of the situation may be thought somewhat biased; but, nevertheless, one feels very strongly that the so-called leaders of labour have been far too late in realizing the serious state into which our industries have been forced, both commercially and financially, by allowing the pernicious doctrines of the extremists in their ranks to have so much sway and influence. The inevitable result has been those incessant and unreasonable demands made during the past year or two upon industry, and to which it was impossible for it to accede without overstrain and loss. In this respect, the gas industry is in no exceptional position. The year through which we are passing has indeed been a veritable storm centre with disputes, strikes, &c., which reached a climax in the deplorable coal stoppage; and after years of seemingly useless revolving, the vicious circle would at last appear to have reached a state of unstable equilibrium, and collapsed, but not unfortunately before evidence of its blighting influence is already apparent on all sides.

While we must all deplore the result of the serious slump in British trade which has caused so much unemployment in practically every city, town, and village throughout the land, and which is brought about, in part, by the unsatisfactory state of international exchange at present operating very adversely for this country—it will be generally admitted that relatively high wages and working costs, acting in conjunction with low production and industrial unrest, have had a very serious effect in the inflation of the price of British goods and raw materials (which were until recently in demand and were recognized as among the best that could be obtained), until there seems to be at the moment no market at all left for us.

Relief works are all right and proper as an emergency measure; but it is not from these that we can hope to recover from the present pass. Our hope lies rather in the direction of reconciliation, co-operation or co-partnership (call it what you may) as between employer and employee, capital and labour; and we can only trust that wiser counsels will prevail in the ranks of labour, because it would seem that nothing but the most loyal co-operation of all sections can pull us through. Now that the air is clearing, and our vision is being restored, it is obvious that the reaction and excitement following on the war brought along with it an inordinate craving for pleasure, slacking, shorter working days, and so on; and if only all classes will receive back with a loyal acceptance the fundamental law and economic truth which has governed the world for a very much longer period than that covered by our industrial system, and which might be summed-up in the words "man must work in order to justify his existence," then our position will without doubt be restored in time.

We require to get back to the principle of every man taking a real interest in his job. Without doubt, there is no room for the idler in any walk of life; and he should not be tolerated in any society. But here there is great danger of misconception and error, because work does not consist merely of muscular effort or manual labour, but also in the proper use of hands or brains. It is gratifying to find that, according to the majority of recent utterances of trade union leaders, there is at least a steady movement in the direction of common sense and reason; and we trust that this may cast-aside all doubt and suspicion, and lead to that spirit of understanding and goodwill which alone will unite us in the determination not to be beaten in the severe commercial struggle of which there is already ample evidence in certain quarters of the globe.

So far as the gas industry is concerned, we have reason to be thankful for the good work performed through the medium of the Federation of Gas Employers, which, by meeting periodically in conference with the workpeople's organizations in the Joint Industrial Council and also the various Regional Councils, has done so much to settle our labour problems amicably on a basis of negotiation and agreement, and thereby effectually to prevent one of those trade upheavals which do so much harm all round and are a permanent reflection on industry.

As we have learned from bitter experience, the course of some of the other large national industries has not been so smooth; and as a result of the de-control of the coal industry on March 31, we have recently emerged from what was doubtless the most protracted and disastrous labour dispute ever experienced in the whole course of our industrial history.

I will not dwell on the respective points of view of parties

chiefly concerned in this dispute, except to repeat the general consensus of opinion of the unfortunate third party—the general public, in which the gas industry is included—that we all deplore the lack of vision, lack of the spirit of negotiation, arbitration, and goodwill, that prevented a settlement being arrived at without all the hardship, disorganization, and serious financial loss resulting from this thirteen weeks' stoppage. It is to be earnestly hoped that with the gradual re-settlement of the coal owners and miners, on what seems one of the best principles to make for permanent peace—namely that which, by the sharing of profit on an agreed basis, provides an incentive for the workpeople to take a real interest in their work and production—this key industry will gradually recover its economic balance.

MAINTAINING THE GAS SUPPLY DURING THE COAL CRISIS.

I question whether there falls within the living memory of any gas manager a more chaotic condition of those things which go to make the daily round of duties, than that from which we emerged in July last. Certainly I cannot recollect anything in the twenty-five years of my gas experience that would compare with those thirteen weeks of continuous struggle against all manner of difficulty. When it is considered how constant and exacting are the demands of the gas consuming public upon our resources, it is a matter of commendation to our profession that such a large number of gas undertakings were able to carry on (either with or without a restricted supply) throughout the whole of this long period. You will have already read some of the remarkable uphill fights made by some undertakings; and I cannot pretend to describe any but our own particular experiences.

The position of my Company as regards coal stocks at March 31 last was not particularly good. The stocks which were heavily depleted during the strike of October last had not been made-up; and after including all the extra quantity secured on rail, we had in stock at the end of March only 5000 tons, included in which there were about 1000 tons of cannel coal left over as a heritage from the coal strike of 1912. This stock represented only about five weeks normal supply. While we had no water gas plant then available, there was a one million Humphreys and Glasgow carburetted water gas unit in course of erection. The contract was fairly well in hand, although there seemed not the slightest prospect of our being able to get it brought into operation in time, seeing that there were no connecting gas-mains laid and the steam-raising plant (which consisted of two 30 ft. by 8 ft. 6 in. Lancashire boilers) was lying detached some distance away from its ultimate site, with a large coke-heap amounting to about 6000 tons intervening.

At the end of five weeks, despite reduced pressures and economies of various kinds, the situation looked very critical; and it was determined that (regardless of the cost) an effort would have to be made temporarily to connect-up the water gas plant by laying emergency gas, steam, water, and other piping. With a total gas-pipe lead of 450 lineal feet, and a temporary steam-pipe lead from another boiler-house of 350 lineal feet, not to mention all the other water, drain, exhaust piping, &c., this looked a somewhat doubtful proposition, especially when the available steam pressure at the existing boiler-house only ranged between 70 lbs. and 90 lbs. per square inch, and it was not possible to obtain a larger connection than 3 in. diameter. Work was commenced on the pipe connections, as we fortunately had a supply in stock; and within a week the various pipes were coupled-up and steam led up to the plant. At first the steam pressure was a source of anxiety; but by covering the pipe-line and working an additional boiler, at the same time increasing the complement of boiler firemen, we were able to obtain a pressure line of 65 to 70 lbs. per square inch and produce water gas, and thus in large measure the situation was saved.

Although we had never previously supplied a mixed coal and water gas, it was possible gradually to bring-down our coal consumption to one-half, and subsequently on the special orders issued by the Mines Department of the Board of Trade under the Emergency Powers Act, 1920, whereby we were obliged to manufacture the maximum amount of water gas that was possible, we gradually increased the percentage of carburetted water gas to 75 p.ct., and reduced the coal gas to 25 p.ct. of that previously sent out. As a matter of fact the percentage of water gas occasionally reached 90 p.ct. and even 100 p.ct. By this means, and with the aid of 2000 tons of mixed coals (some very good and others indescribably bad), all purchased at a most prohibitive price, we were able to continue our supplies to the end. While our coal position was not good, our coke stocks were fortunately high, and as we thought more than sufficient to carry us through.

It is with happy reflection that we remember how it was possible to help others in distress; and I also acknowledge with much gratification how many were the evidences of friendly help at various times during the coal crisis. But soon our own district's call for coke became abnormal, and we were compelled to adopt very drastic measures to prevent raiders from another neighbouring town from clearing us entirely out. As it turned out, we were ourselves eventually compelled to purchase about 140 tons of oven-coke to carry us through. Those who, like ourselves, had the misfortune to have to purchase reparation and Belgian coal will probably never forget the appalling conditions thus brought about. The coking qualities were conspicuous by their absence; and after a few days working with this and the product of a neighbouring colliery heap, our heats were gone and the furnaces almost completely out. I shall not readily forget the condition of things which seemed to reach a climax when, after charging periods of about sixteen hours, the residuum had to be pushed-out of the retorts and removed by the coke conveyors. The difficulties may be imagined when it is mentioned that it became necessary to deposit coke (taken from the yard stock) into the conveyor troughs in order to entice the rubbish out of the retort-house.

The following proximate analysis shows some of the varieties of coal purchased:

Sample.	A.	B.	C.	D.	E.	F.	G.	H.
Coking properties	Feeble	*Nil*	Feeble	Good	Feeble	Feeble	Good	*Nil*
	P.Ct.	P.Ct.	P.Ct.	P.Ct.	P.Ct.	P.Ct.	P.Ct.	P.Ct.
Moisture .	2·36	14·28	3·42	1·45	2·32	4·00	1·34	5·22
Volatiles .	19·30	26·28	16·82	32·21	20·62	20·40	28·03	29·82
Fixed carbon .	40·2	47·32	59·00	56·13	55·00	52·60	63·94	48·48
Ash . .	38·14	11·92	20·76	10·21	22·06	23·00	6·69	16·48
Total .	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

In one or two instances quite good results were obtained, as in the case of that marked D, which was an American variety, and also G—a British variety. But in the other cases, notably that marked C which was also of American extraction, and E and F which were reparation and Belgian varieties and gave a coal gas yield of less than 5000 c.ft. per ton, the results were indescribably bad.

There are not many people outside the ranks of our profession who realized what a harassing time it was for those in our industry who, unable for one moment to get away from the legitimate requirements of the general public, had to overcome so many obstacles. As a general rule, however, the public were very patient and reasonable, and ready to take these factors into consideration, though they little know what a serious burden the cost of the service placed on some undertakings. The excellent work performed by the National Gas Council, acting as it did in its advisory and official capacity both to its members and also at Whitehall, should not be overlooked.

One of the mitigating factors (if I may term it so) of this testing time, was the opportunity afforded to many of us of observing the general effect of varying mixtures of coal gas and water gas when used throughout the district. It would be idle for me to pretend that such variations as from 100 p.ct. of coal gas to 90 to 100 p.ct. of carburetted water gas did not cause inconvenience and trouble at consumers' appliances. With mixtures up to 50 p.ct. of carburetted water gas the general effect was an all-round improvement, especially in incandescent burners. The decrease in inerts, and the advantage derived from the higher thermal intensity of the bunsen flame produced by the increased proportion of carbon monoxide in the mixed gas was distinctly noticeable. Beyond this figure, however, difficulty was experienced especially with back-firing at cookers, wash-boilers, and certain makes of gas-fires, also noisy bunsens caused by over-aeration, though it should be borne in mind that diminished pressures had the tendency greatly to aggravate the trouble.

The following complete analysis shows the gradual transition in quality during the course of the crisis.

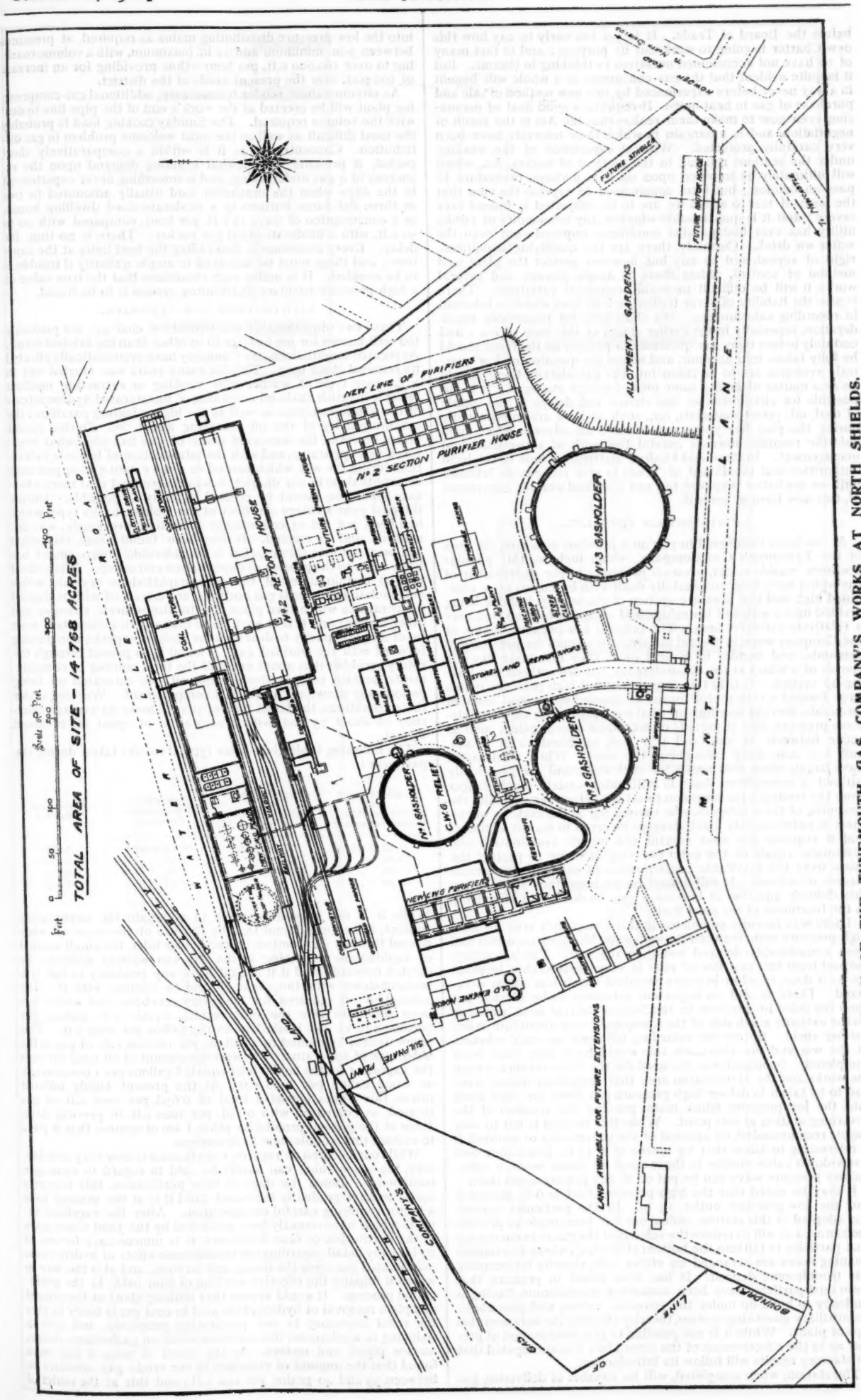
Composition of Gas.	A. Straight Coal Gas.	B. 15 p.ct. C.W.G. 85 p.ct. Coal Gas.	C. 30 p.ct. C.W.G. 70 p.ct. Coal Gas.	D. 50 p.ct. C.W.G. 50 p.ct. Coal Gas.	E. 70 p.ct. C.W.G. 30 p.ct. Coal Gas.	F. 90 p.ct. C.W.G. 10 p.ct. Coal Gas.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
CO_2	3·5	2·4	3·9	4·8	4·4	2·8
O_2	0·5	0·6	0·7	1·1	0·6	0·8
Illuminants . .	2·8	2·8	4·3	4·3	4·0	4·6
CO	5·0	13·6	16·7	19·8	23·4	30·6
CH_4	25·5	20·8	19·1	14·7	11·0	8·1
H_2	44·9	43·5	39·9	40·8	37·3	41·5
N_2	17·8	16·3	15·4	14·5	19·3	11·6
Cal. value . B.Th.U.	500	490	450	490	440	450

Generally, throughout the whole period, oil-enrichment was used; and this varied in amount from 1¼ gallons to 1¾ gallons per 1000 c.ft. of carburetted water gas made, the oil proportion being gradually increased as the percentage of water gas in the mixture was raised. The considerable variation in the percentage of carbon monoxide, up to over 30 p.ct. in the finished gas, afforded an opportunity for experience which was not anticipated when the Special Committee was appointed by the Board of Trade to inquire into the question of the limitation of this constituent in town's gas; and, apart from the need of regulation and adjustment, the general absence of the hypothetical dangers said to exist with such high proportions of carbon monoxide afforded ample proof that there was no necessity for restrictions.

It is now very satisfactory to know from the report of the Carbon Monoxide Committee (recently published), that its recommendation to the Board of Trade is that no limitation of carbon monoxide should be imposed upon the industry.

GAS REGULATION ACT.

Many undertakings have now obtained Orders under section 1 of the Gas Regulation Act, and others have their applications



PLAN OF THE TYNEMOUTH GAS COMPANY'S WORKS AT NORTH SHIELDS.

before the Board of Trade. It is yet too early to say how this new Charter is going to work out its purpose; and in fact many of us have not accustomed ourselves to thinking in therms. But it is quite evident that the gas consumers as a whole will benefit in a way never before experienced by this new method of sale and purchase of gas in heat units. It requires a good deal of persuasion even now to make them realize that the Act is the result of negotiation, and is a bargain in which their interests have been very carefully protected. Without experience of the working under the sections relating to the method of testing, &c., which will ultimately be imposed upon us, it is perhaps premature to pass an opinion; but I am constrained to express the view that the form of test to which we are to be subjected is indeed very severe; and it is questionable whether any commodity of public utility has ever had parallel conditions imposed—not even the water we drink. Certainly, there are the qualifying conditions, right of appeal, and so on; but, however perfect the plant and method of control, unless there is ample storage and several works, it will be difficult to avoid occasional variations. There is also the liability of error (either high or low) which is inherent in recording calorimeters. We shall look for reasonable consideration, especially in the earlier stages of this new *régime*; and certainly before there are questions of penalty all the facts should be fully taken into account, and where the question of low quarterly averages are to be taken into the calculation, there should be as a matter of equity some offset for high averages. It is impossible for circumstances like strikes and delays in the supply of coal, oil, retort materials, &c., such as have arisen repeatedly during the past few years, not to have an adverse effect upon calorific records, however careful the work of supervision and management. In these and kindred matters, we look to the local authorities and the Board of Trade to give reasonable latitude, until we are better prepared for, and have had working experience of, this new form of control.

DISTRIBUTION PROBLEMS.

As has been mentioned to you on a previous occasion, the area of the Tynemouth Gas Company, which includes this popular northern seaside resort, presents problems in the distribution of gas which have been successfully dealt with by means of a combined high and low pressure system of gas supply, besides being divided into a series of townships and villages which stretch over a relatively extensive area. The original low-pressure mains of the Company were, in several instances, too small for present-day demands, and besides in several cases they terminate like the spokes of a wheel at the circumference but are without any linking-up system. It is in this connection that high-pressure mains have formed a very useful means of looping-up several isolated terminals, thereby levelling-up what were previously very troublesome pressure dips at periods of maximum consumption, such as occur between 11 a.m. and 1.30 p.m. on Sundays or 7 a.m. and 8.30 a.m. daily throughout the week. While steel mains have largely come into vogue for such work, and are practically without a competitor, there is still unfortunately much danger from the tendency for corrosion to set in. However carefully the wrapping of these tubes may be carried out at the maker's works, there is unfortunately much damage incurred in transit at times; and it requires the most careful and minute examination and systematic repair of the outer covering in order to protect the tubes from the inevitable consequences of exposure in certain classes of subsoil. It will indeed be an important stride when this difficult question of corrosion can be dealt with effectively in the treatment of the steel itself.

There was recently completed in this Company's area an 8-in. high-pressure main between the works and Monkseaton which had been considerably delayed owing to the war. The advantage derived from this new line of pipe is very considerable, looping-up, as it does, to a low-pressure terminal which was much overtaxed. There is still an important extension to be carried out from the point in question to the Seaton Delaval area, which is on the extreme north side of the Company's area about four miles further afield. But for the retarding influence on such schemes of the war and the aftermath, this would have long since been completed. So urgent was the need for the 8-in. section between the works and the Monkseaton area that temporary means have had to be taken to deliver high-pressure gas from the steel main into the low-pressure trunk main, pending the erection of the governing station at this point. While this method is not by any means recommended, on account of the uncertainty of control, it is interesting to know that by means of a 1½-in. connection and screw-down valve, similar to those used on steam work, a satisfactory pressure wave can be put on at any pre-arranged time.

It may be noted that the high-pressure inlet is 6-in. diameter and the low-pressure outlet 14 in. In the particular screen-box adopted at this station, endeavour has been made to provide such an area as will so reduce the velocity of the gas as to encourage dust particles to fall into the bottom of the box, where convenient cleaning doors are arranged on either side, thereby intercepting this troublesome deposit. It has been found in practice that these dust particles have been somewhat troublesome, having a tendency to build-up under the governor valves, and also choke the auxiliary governing system, thereby affecting the action of this type of plant. While it is not possible to give information at present as to the effectiveness of the screen box, it is anticipated that satisfactory results will follow its introduction.

The station, when completed, will be capable of delivering gas into the low-pressure distributing mains as required, at pressures between 3-in. minimum and 12-in. maximum, with a volume reaching to over 100,000 c.ft. per hour—thus providing for an increase of 100 p.ct. over the present needs of the district.

As circumstances render it necessary, additional gas-compressing plant will be erected at the work's end of the pipe-line to deal with the volume required. The Sunday cooking load is probably the most difficult as well as the most welcome problem in gas distribution. Concentrated as it is within a comparatively short period, it presents a somewhat exacting demand upon the resources of a gas undertaking, and is something never experienced in the days when the maximum load usually amounted to two or three flat-flame burners in a moderate-sized dwelling house, or a consumption of (say) 15 c.ft. per hour, compared with 40 to 50 c.ft. with a moderate-sized gas cooker. There is no time for delay. Every consumer is demanding the heat units at the same time; and these must be delivered in ample quantity if trouble is to be avoided. It is under such conditions that the true value of a high-pressure auxiliary distributing system is to be found.

NAPHTHALENE AND CYANOGEN.

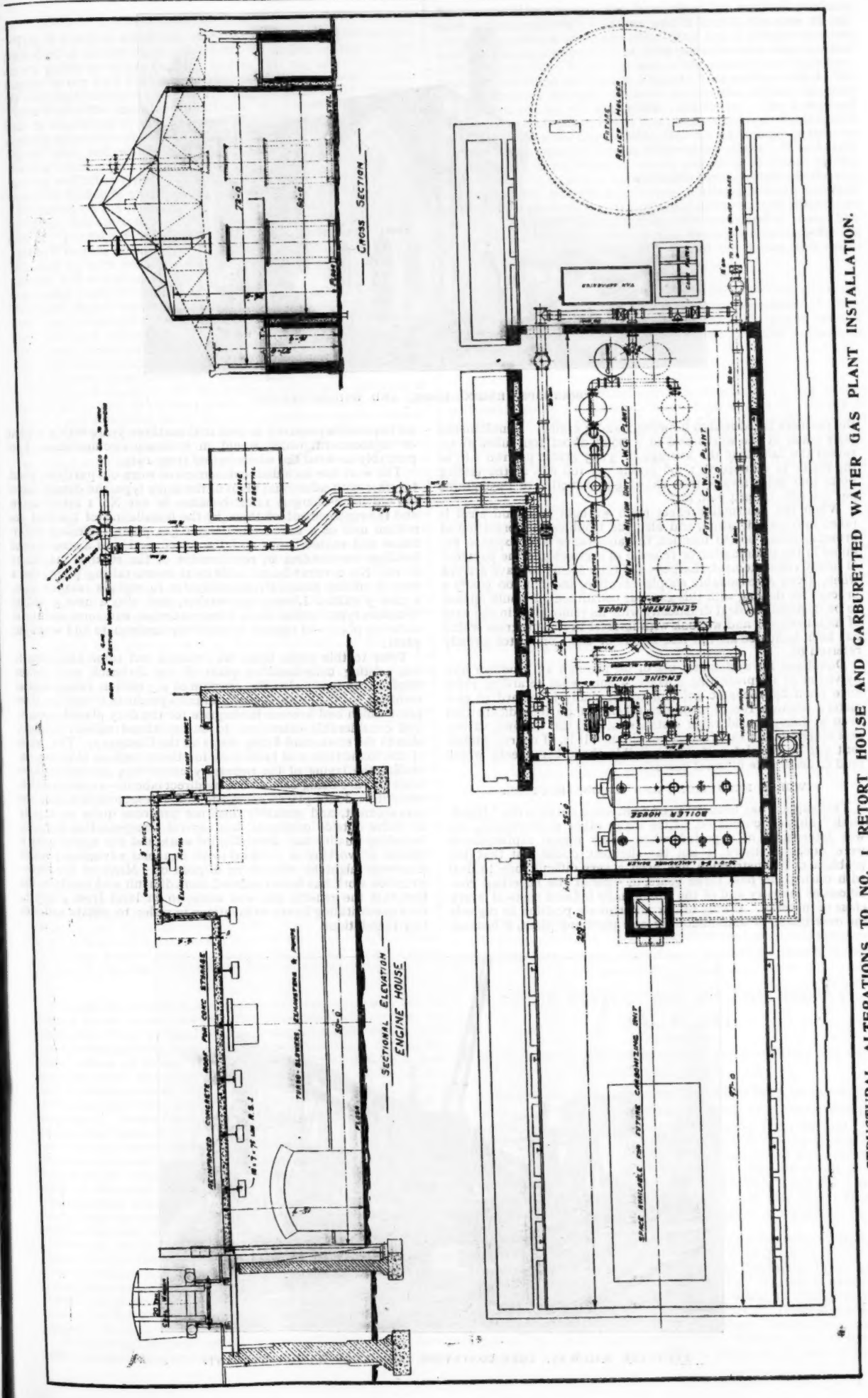
These two objectionable constituents of coal gas are probably too well-known for me to refer to in other than the briefest terms. As regards naphthalene, my Company have systematically effected its removal since 1905. This for many years was carried out in a Livesey type of washer; the washing or extracting medium being a Scottish shale oil consisting of unsaturated hydrocarbons of the napthene series, as well as the higher boiling paraffins; the specific gravity of the oil averaging about ·85. During recent years, however, the increased make of gas has somewhat overtaxed this apparatus, and with the introduction of benzole extraction during the war, which caused to some extent a re-appearance of naphthalene in our district, it was determined that more effective apparatus should be erected as early as possible. During the past year a rotary scrubber of the Holmes brush type, which had been put out of commission some time previously, was dismantled and re-erected. It has been found since this plant has been put into service, that a considerable improvement has been made in the process of naphthalene extraction. It is evident that at certain times of the year naphthalene crystals which accumulate in the coal gas purifiers, are driven off with increased temperatures which take place, due to atmospheric changes and other causes; and it is at such times that an extraction plant must be of ample capacity to deal with the rush of naphthalene passing forward with the purified gas. The oil is so passed through the rotary scrubber that about one-half the total number of compartments contain comparatively fresh oil, the saturated oil being periodically drawn off at the last compartment. Working under these conditions, the latest type of plant shows an average efficiency of about 75 p.ct. with a saturation of spent oil of about 14 p.ct.

The following table gives some typical results taken during the past year:

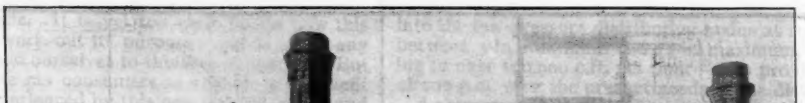
Naphthalene in Gas. Inlet Scrubber. (Grains per 100 c.ft.)	Naphthalene in Gas. Outlet Scrubber. (Grains per 100 c.ft.)	Amount of Naphthalene Removed.	Percentage Efficiency.
9·50 grains	2·96 grains	6·54 grains	68·80
10·00 ,,	2·30 ,,	7·70 ,,	77·00
12·00 ,,	3·20 ,,	8·80 ,,	73·30
20·50 ,,	3·50 ,,	17·00 ,,	82·90

While it is not possible entirely to eliminate the naphthalene content, it has been found that by the use of the same oil when passed through an atomizer on the holder inlet, the small amount of naphthalene remaining in the gas can without difficulty be carried forward; and if it should have any tendency to fall, it is brought-down with the shale oil and in solution with it. The amount of oil required for the rotary scrubber, and which has been found to give the best results, equals 1·83 gallons per 100,000 c.ft. of gas treated, or 0·0183 gallon per 1000 c.ft. This figure usually amounted to 2 gallons per 100,000 c.ft. of gas in the older type of apparatus. The average amount of oil used through the vaporizer on the holder inlet equals 8 gallons per 1,000,000 c.ft. or 0·008 gallon per 1000 c.ft. At the present highly inflated prices, this works out at a total of 0·65d. per 1000 c.ft. of gas treated, as compared with 0·15d. per 1000 c.ft. in pre-war days. Even at the present prohibitive price, I am of opinion that it pays to extract this troublesome hydrocarbon.

While our position as regards naphthalene is now very satisfactory, the same thing can hardly be said in regard to cyanogen compounds. Since the days of lime purification, this impurity seems to have gradually increased, until it is at the present time a factor requiring careful consideration. After the excellent reports which have recently been published by the Joint Committee of the Institution of Gas Engineers, it is unnecessary for me to go into any detail regarding the troublesome effect of hydrocyanic acid in coal gas upon the mains and services, and also the way in which it impairs the effective working of iron oxide in the purification process. It would appear that nothing short of the almost complete removal of hydrocyanic acid in coal gas is likely to give the relief necessary in our purification processes, and also in reducing to a minimum the corrosive effect on gasholders, mains, service pipes, and meters. As the result of tests, it has been found that the amount of cyanogen in our crude gas amounts to between 35 and 40 grains per 100 c.ft., and this at the outlet of



STRUCTURAL ALTERATIONS TO NO. 1 RETORT HOUSE AND CARBURETTED WATER GAS PLANT INSTALLATION.



WORKSHOPS, ENGINE-ROOM, AND BOILER-HOUSES.

the purifiers is reduced to between 2 and 3 grains. Simultaneous tests taken at the works and at a point about four miles away, reveal the fact that the average of 3·055 grains per 100 c.ft. at the works is reduced to 1·796 grains per 100 c.ft. at the testing point four miles away—thus showing a reduction of 1·259 grains per 100 c.ft., or 42·4 p.ct. loss.

When the destructive effect upon wrought iron and steel is taken into consideration, and also the troublesome formation of prussian blue—not to mention the annoyance and expense entailed in the examination or renewal of services and the payment of heavy reinstatement charges—the time seems to have arrived when, given a reasonably simple, effective, and not too costly a process for dealing with this gaseous constituent, it would appear to be desirable to deal drastically with its removal as in the case of naphthalene; and we look with interest to the progress which has been indicated in the last report of the Committee already referred to.

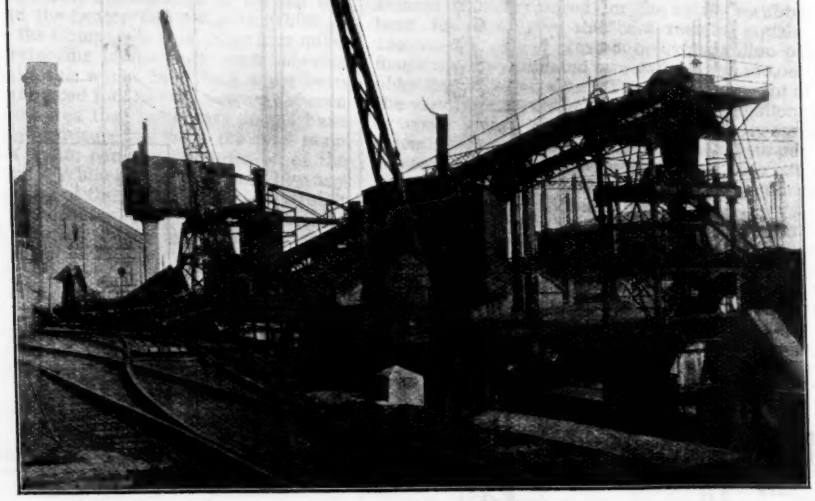
Doubtless, the systematic use of oil through an atomizer has, by virtue of its protecting surface, a somewhat retarding influence upon hydrocyanic acid, more especially in regard to gas-meters, because recent examples taken out go to indicate that even at fairly considerable distances away, the bellows, valves, and seats are in a satisfactory condition. It is, of course, important also to restrict as far as possible the other agents which tend to accelerate internal corrosion.

WORKS EXTENSIONS AND RECONSTRUCTION.

This subject has been referred to in some detail in the "Handbook" already circulated. Like many other undertakings, the war intervened at a period when many urgent replacements were due, and there is not the slightest doubt but that the problem of reconstruction has been a very difficult one to deal with during the past three years, in view of the unsettled conditions of industry and of the abnormally inflated costs of every class of material. Owing to our unfortunate position as regards the over-taxing of manufacturing and purifying plant, it became an imperative necessity to deal in these three years with a scheme of replacement, which would in ordinary circumstances have probably covered the whole period from 1914.

The work has included replacement of worn-out purifying plant, together with additional plant of the same type, the demolition of the old hand-charged retort-benches in our No. 1 retort-house, and the replacement of them by the installation of the first one million unit of a carburetted water gas plant, including boiler-house and engine-house and the lower section of a steel-framed building surrounding it, replacement of the stoking machinery in our No. 2 retort-house, additional steam-raising plant, and a new 2½ million steam-driven exhauster to replace smaller units, a new 3 million Livesey gas-washer, and also a new 3 million Whessoe type vertical water-tube condenser, and some additional metering plant—to replace respectively inadequate and worn-out plant.

Prior to this work, there was carried out some extension to our existing coke-handling plant of the Babcock and Wilcox tipping tray type; also the erection of a 3 million rotary washer scrubber for the extraction of ammonia products to replace other plant which had become inadequate for the duty placed upon it, and considerable extensions to our overhead railway viaducts, also to the stores and fitting shops of the Company. The whole of the foundation and brickwork for these various schemes (including the laying of the necessary connecting gas-mains) have been and are being carried-out by direct labour—a system which, while it no doubt places some additional responsibility upon the management, and probably does not progress quite so rapidly as under outside contracts, has several compensating features, including quality and durability of work and the opportunity it affords of working-in material (with financial advantage) which otherwise might be difficult to dispose of. Much of the reconstruction work has been rendered more difficult and costly by the fact that the general site was made-up in level from 4 to 5 ft., thus necessitating heavy excavations in order to obtain satisfactory foundations.



ELEVATED RAILWAY, COKE-CONVEYING, AND COKE-HANDLING PLANT.

CALORIFIC VALUE.

This is a matter which has exercised, and is still exercising, a good deal of our attention. We must all decide sooner or later on our policy as to gas quality; and in this we shall be guided largely by our own working experiences of the particular character and requirements of our district and the plant at our disposal. There is also the important question of the possibilities and latitude of regulation of the large quantity of heating, lighting, and cooking apparatus already installed in our areas at considerable capital cost, and which it is our duty to retain at the highest working efficiency—not to mention the use of gas through metal melting and other types of industrial furnace and apparatus. It would be foolish to attempt to impose upon any undertaking such a limitation on the reduction of calorific power as would prevent its taking full advantage of the possibilities that lie in the direction of "partial," if not of "complete," gasification, and thereby enable it to pass on whatever economic advantage there may be obtained by such reduction to the gas consumer. In this connection, it is a matter for gratification that, as the result of the knowledge made known through the excellent work of the Fuel Research Board under the leadership of Sir George Beilby, our own Gas Investigation Committee and also the Leeds University staff, we have reason to believe the Board of Trade are taking a broad and reasonable view in this matter, and thus helping to dispel misunderstandings on the part of those who carry authority in matters appertaining to Public Utility Services.

There is, of course, in our own ranks a fairly wide diversity of opinion as to what is the best quality of gas to manufacture and supply; and I suppose (as in Art and Literature) that there would seem to be various schools of thought on this subject, and extremes as well as means. After the varied experiences of recent years, and especially during the past six months, I am of opinion that, bearing all the factors in mind—such as works and plant, distributing systems, apparatus in use, &c.—in our case a mixed gas having a value of between 450 and 475 B.Th.U. is most likely to give the best all-round results, and give the consumer the least trouble in the lighting, regulating, and control, and at the same time produce with silent flames the most efficient results in heating and lighting service, and in the operations of cooking, boiling the kettle, &c, with the lowest time factor consistent with minimum cost of production and supply. As I have already said, however, this is a matter in which we must all be guided by our own individual experiences, and the character and needs of our district and gas consumers.

I should like here to refer to the much-discussed question of the lighting load. It would be idle to ignore the convenience and suitability of the competitive illuminant, electricity, as a lighting agent applied to certain conditions. But there is not the slightest reason why this should tend to displace incandescent gas in the vast majority of instances where it can and does perform excellent service in the lighting of our houses and streets. There is some truth in the fact that our commodity is often displaced because of unsuitability or obsolescence of apparatus, or hopeless neglect on the part of those possessing it; and it is in instances such as these, where good salesmanship and showroom display are indispensable, that enlightenment can be brought to bear where this is needed, and good modern pendants, burners, and shades be shown to advantage. In this connection I am pleased to make known that in one instance of a housing scheme where we were approached to supply gas for wash-boilers, but where it had been decided to instal electricity for lighting, we were eventually able to obtain the lighting of both the houses as well as the streets. The question of obsolescence is also a vital matter in regard to street lighting; and here, again, we have recently succeeded in retaining gas by demonstrating what could be effected by good modern inverted cluster sets in place of worn-out upright burners. In another area we recently succeeded in securing inverted incandescent gas for street lighting by displacing electricity.

CONCLUSION.

I should like, in conclusion, to refer to the excellent services performed by our various organizations, the skilful management and leadership of the National Gas Council, the splendid development and advertising work of the British Commercial Gas Association, which, above all things, is always so convincing and up-to-date, the most useful functions of the Federation of Gas Employers, and the indispensable work of our Commercial Sections, which, so far as this Association is concerned, we could not afford to be without. In the face of enormous difficulties, our industry has braved the adverse conditions all around it. We stand, as it were, on the threshold, looking forward with hope for the future. We are organized in a way which perhaps has not been excelled in any other equally important national utility service; and in spite of the most exacting experiences of the immediate past (during which there has surely been no harder worked profession), we have in our ranks men who are practically, without exception, devoted to their work and to the service of the general public. All we ask for is fair play—a fair opportunity, and reasonable forbearance in the present transitional period. We freely admit that the present economic price of our commodity is (due to circumstances entirely beyond control) relatively high, and this will be brought down as soon as the circumstances, financial and commercial, which have such a vital bearing in the matter, permit of its being done.

It should not be forgotten that we are still labouring under the adverse effects of a coal bill that for magnitude is without precedent in our history; and at a time when our residual products have almost completely failed us, and in fact in the case of sulphate of ammonia are more often than not a charge upon our undertakings, bringing as it has done prices in some instances less than those obtained before the war, while some of our other bye-products are at the moment an absolute drug on the market. We are furthermore heavily burdened under the serious financial loss occasioned by the deplorable coal strike. The downward movement in coal prices is the first glimmer of hope; but it will be some time before we can possibly feel the advantage of this reduction, which must be quickly followed by others. It is hardly a fair position to be placed in when, according to recent prices, we are being asked to pay for materials such as retorts, firebricks, cast-iron pipes, wrought-iron tubes, portland cement, common bricks, iron and steel, &c., at rates in most cases over three times the figure they were in 1914 and in some considerably more than this. Given fair play in these matters, there is ample scope for the future development of our industry amid the homes and workshops of the land.

REFLECTIONS ON THE RECENT COAL STRIKE.

Mr. S. SHADBOLT afterwards submitted a paper entitled: "Some Reflections on the Recent Coal Strike." This paper, with a report of the discussion, will be found on this and subsequent pages.

VOTE OF THANKS.

Mr. J. E. BLUNDELL (Carlisle), Vice-President, moved a vote of thanks to the President for his address and to Mr. Shadbolt for his paper. He said they had had a long list of distinguished Presidents in the past; and he was sure Mr. Willis was upholding the best traditions of the office. He had come to it at a time when everything was bad, and the outlook dark. They had seen how he had risen to the occasion. They knew he had laid himself out to make the meeting a success; and they saw how well he had succeeded. [Applause.] Referring to Mr. Shadbolt, he said he had heard him described as the "K.C." of the North of England Gas Managers' Association; and he did know that, whenever Mr. Shadbolt came to the meeting, he brought a fund of wise counsel to bear on all their discussions. The paper he had submitted that day gave them a great deal to think about; and he believed it would be carefully studied long after the meeting.

Mr. C. DRU DRURY (Sunderland) seconded the resolution, remarking that the presidential address was a thoughtful and impressive one—typical of the man himself and of his ability as an engineer. He felt sure he voiced the opinion of all when he said that they had enjoyed every moment of their visit to the meeting, thanks largely to the work of the President. He thought the way in which Mr. Willis overcame his difficulties during the strike was a matter for congratulation; and the erection of the water-gas plant against time must have been very exciting. It was a bold and successful temporary arrangement. Their sympathies and congratulations were with Mr. Shadbolt—sympathy that he had had to prepare his paper while on holiday and congratulations that he had the courage to send out gas of 275 B.Th.U.; and, certainly, so far as they could see, with considerable success. The coal strike was a most deplorable event; but it was an ill wind that blew nobody any good. It certainly showed them what they could and could not do, in a way which would otherwise not have been possible. Regarding the question of the quality of gas, the remarks that day appeared to him to show that they had a question on which they must hasten slowly.

The vote of thanks was cordially passed.

Later, a visit was paid to the works of the Tynemouth Gas Company, where Mr. Young (the Chairman) welcomed the guests. The Directors of the Company were thanked for their hospitality.

SOME REFLECTIONS ON THE RECENT COAL STRIKE.

By S. SHADBOLT, of the Southbank and Normanby Gas Light and Coke Company, Ltd.

The colliers' strike of 1921 will probably long be remembered by most of us as the high-water mark of national industrial dispute, vitally affecting our own industry from without. The question of carrying larger stocks of coal (in reserve against such contingencies) than has hitherto been usual, will have exercised the minds of many; but whatever the ultimate result in this direction may be, there appears to be little need for hurried action, as, with all due regard for the old saw that "History repeats itself," we need hardly anticipate a repetition in this instance in the near future.

The gas industry generally appears to have emerged from the strike period with a remarkably good record for "carrying on," as the many recent paragraphs in the Technical Press giving individual engineers' experiences testify. In many cases this has only been done at enormous cost; while, of course, in some instances a total cessation of supply occurred. In other places the full supplies seem to have been maintained, though these undertakings have been comparatively few. Without a doubt the vast majority had at least to exercise a strict curtailment of district

pressures in order to eke-out available supplies; while the substances carbonized, and the methods adopted to secure the utmost returns, have revealed a versatility almost astonishing. Government action in the issue of the different Emergency Orders helped materially in strengthening the hands of gas authorities towards economizing fuel and restricting gas supplies; but the writer ventures to assert—in the actual event proved to an extent which would have been irresistibly funny, had it not been seriously embarrassing—the futility of attempting to control the private actions of the individual by peremptory mandate. Certainly in my own experience, the counterpart of "the man in the street"—the consumer in the house—was not impressed to any great extent by all the official decrees, and only the dead-weights on the district governors had any persuasive effect towards economy.

Fuel available, as has been noted, varied tremendously; but speaking of reputed coal supplies generally, two outstanding impressions remain—on the one hand of the wretched quality of coal which was shipped to us from our late Continental allies, and on the other hand of the shameless profiteering indulged in by some of our native coal distributors, in getting rid of old pit-bank rubbish heaps. In the first case, possibly our Continental friends felt a desire to get level for the prices and quality of English gas-coke, or maybe felt a strong desire to pass on a taste of German reparation. Whatever justification in fact may exist for these speculations, the great bulk of the Continental coal was extremely poor. The question of profiteering in home-produced rubbish, however, presents a factor which will doubless to some extent right itself by being remembered against those who were responsible. In the writer's own case, the only purchase of foreign coal, although very expensive, brought into use a moderate sample of French-raised coal which gave fairly decent results; but the purchase of a parcel of English slack proved an unadulterated trouble, and brought us to the pass of sending out for about a week undiluted blue water gas. We were fortunate enough to secure one parcel of English gas-coal at a reasonable figure, early on during the strike; and by one means or another we can record ourselves as among those who pulled through without quite shutting-down. The balance-sheets of many of our undertakings reveal another lamentable feature of the strike, and provide for once a striking sidelight on the possible disadvantage of "enjoying a monopoly" in public utility service. Deeply ingrained in the administrators of our industry is undoubtedly a tenacity of purpose (born of long unbroken records) to maintain supplies under every condition; and when all has been said in favour of this, including the questions of prestige and reputation, the writer feels that many boards and committees will, on reflection, decide that the price paid has been higher than was warranted. Undoubtedly to my mind, in circumstances such as we are considering, as in other national crises, it is easily possible to be carried far beyond the reach of reason on the crest of a wave of popular sentiment; and a self-imposed financial martyrdom or suicide (call it which you like) is hardly justified. At all events, recent experience will probably mean that many undertakings would not readily again pay such a price to carry on with so little tangible compensation in view, should a similar position ever develop.

Whatever else the strike has done or undone, however, it has most certainly provided an opportunity (in most cases forced upon us the necessity) for practical experience in the production and distribution of gas of lower heating value than usual. The extent to which this experience may be beneficial represents at any rate one possible advantage, from an incident with few other compensations; and the writer feels that from this point of view, in the hope of provoking a free discussion, the relation of his own experience and deductions may serve a useful purpose. For a proper consideration of any individual case, a knowledge of the circumstances involved is of course necessary, and so a brief *résumé* of my own position and circumstances previous to the strike will perhaps be desirable. My connection with the South Bank Gas Company dates from November, 1915. Although the demand for gas with us as in many cases eased a little during the first year or so of war, the war-time activities of the iron and steel works in the district, together with the intense speeding-up of shipyard work, soon produced an increasing demand which has steadily persisted ever since, until our present rate of output is 50 p.ct. more than our pre-war maximum. Fortunately, one of my first duties was to complete and bring into use a machine-worked, horizontal through-retort installation (by Drake), which was well in hand at the time of my appointment. This made our position much better than it otherwise would have been, but did not provide sufficiently for the increase since realized, and consequently the question of further generating plant had to be dealt with in 1920. As regards distribution, it was evident from the first that we should have largely to overhaul the mains throughout the area, as many were becoming overtaxed before the war.

How the many insistent demands for economy, the inability to choose one's coal supplies (with its consequent constant attempts to carbonize dirt), the urgent need for toluole and benzole extraction, and the various strikes and industrial disturbances during the war, resulted in the recognition of the possibilities of gas as low as 450 and ultimately 425 B.Th.U. by the Board of Trade in emergency instructions, is all now a matter of history; and out of all these things and the unavoidable financial strain accompanying them, has now emerged the Gas Regulation Act (1920), with its opening of new doors and closing of old ones—all of which have brought our industry generally face to face with the question of the best way to supply heat units economically. For some years the writer has had a growing conviction that the lower the heating value per cubic foot, the cheaper should be the production and supply of B.Th.U.; and granting this as a primary factor, the only logical limit to the reduction in standards should be the restriction realized by the adaptability of the consumers' existing appliances—provided always, of course, that no insuperable difficulty presents itself in any given case to either the manufacture or distribution of any particular grade of gas. And here it must be acknowledged that other people's experience seems to indicate that some classes of consumer, especially among industrial users, are not so easily adaptable to lower-grade gas as others.

The bulk of the gas supplied by the Southbank Company is used for lighting, cooking, and heating. The power load is very small; and industrial consumption, *nil*. Unfortunately the war, with its depletion of staffs and systematic enlistment of the young men, made it impossible in the writer's case to establish any regular practice (until fairly recently) in the matter of testing and recording gas qualities and composition; and only occasional tests were possible. In 1916, however, the Company were producing in the machine-stoked house, with the coals supplied, a gas which, with a little air for the purifiers, was of 500 to 550 B.Th.U. with an average yield of 12,000 c.ft. per ton. In 1918, the writer commenced steaming retorts, and in conjunction with Mr. Clapham, of Redcar, developed a method which by 1920 was producing (with less air admitted for the purifiers) a gas of from 425 to 450 B.Th.U. and about 15,500 to 16,000 c.ft. per ton. The descent had been carefully spread over the period, of course; and on the principle that the prime duty of a gas undertaking is to supply gas, a steady line in the one direction was pursued, despite the temptation to consider residuals first, during the coke boom of last year. During 1920, a Tully plant was installed, and very late in the year brought into use. Owing to the difficulties of the autumn coal strike of last year and certain initial troubles with the plant, this apparatus did not come into full operation at once; but by January of the present year, we had practical experience of a mixture of straight coal gas and gas produced by coal distillation in the Tully plant (Tully gas, the writer prefers to call this, as distinct from water gas only) without any atmospheric inerts added, which had been round about 400 and as low as 390 B.Th.U. After deliberately trying a little lower, such results were found as justified the belief in 400 B.Th.U. as a sufficient quality, and saw us supplying about 400 to 415 B.Th.U. immediately prior to the strike.

At the commencement of the strike, the Tully plant was not in use; but it was started up before the end of April, and as we had in hand about 130 tons of a steam-coal specially bought for this plant (which I ought to say was erected with a view to total gasification of coal only), we managed fairly well until May was about half gone. Then, as our steam-coal supply was dwindling, we began to use a mixture of coal and coke in the Tully plant; and on account of the gas-coal stock vanishing, and by reason of effecting a reduction in our output, we increased the proportion of Tully gas to coal gas. Following this, in an attempt to avoid purchasing foreign coal, we took a parcel of English slack, which proved to be the most hopeless rubbish I have ever attempted to make gas from. This indeed was so useless that we were reduced during early June to sending out blue water gas only—all other coal having by then been used, and creosote, the only available enricher, having proved of practically no assistance under our conditions. During this period we actually registered a calorific value below 280 on one or two occasions; and although this constituted a mark to which one had not contemplated descending, it was surprising what careful adjustment did in the way of burner efficiency, particularly with boiling burners and lighting. Following this, we got a small cargo of French coal, which carried our retort-house on to the end of the strike; and with coke only in the Tully plant, we picked up a little in quality towards the end. Hereabouts like many others we found ourselves, after letting our coke stocks gradually go to local domestic consumers (without any increase in charges), compelled to buy the poorest of poor furnace coke, in order to carry on our own gas-making operations. An average of the recorded calorific tests during the three distinct months of the strike is very instructive. April: Average, 418 B.Th.U.; maximum, 440; minimum, 386; Tully plant off more than half this month. May: Average, 359 B.Th.U.; maximum, 399; minimum, 321. June: Average, 302 B.Th.U.; maximum, 334; minimum, 275. As soon as deliveries of coal were resumed, we began to lift our calorific value; and the dirty condition of the earlier consignments, together with the remaining slack and a portion of the French coal (which, by the way, caused trouble by spontaneous heating when covered with some Durham unscreened), effectively prevented a too sudden jump to pre-strike quality. But by the latter part of July we again had the Tully plant operating on coal, and passable samples of gas-coal reaching our retorts. The general satisfaction expressed when we again reached 400 B.Th.U. was well marked and very gratifying.

Thus in the writer's own case the strike brought along a series of experiences, which not only gave opportunities to test, but in the testing fully confirmed a belief in, 400 B.Th.U. gas as quite a reasonable quality for the domestic and lighting load. For gas-engine purposes, it is, of course, quite good. Of industrial uses I cannot speak at first hand; but the experiences of members from their own particular angle should be instructive. My own observations have persuaded me that more attention to the importance of flame shape and contact, of wasted *versus* utilized B.Th.U. (particularly in such domestic matters as boiling water and incan-

descent lighting) should not only emphasize the extra efficiency attainable, with late-pattern burners and small mantle lighting units, but indicate more plainly the good qualities in lower-grade gas supplies. While in the case of many small works I would suggest that probably systematic testing would reveal that calorific values actually distributed are somewhat lower than has been hitherto assumed.

Before concluding I wish to make myself understood. These notes are not intended as a paper on low-grade gas, or they would have been so described. They merely record the most lasting impressions on the writer's mind of the many resulting from the recent strike; and simple fact demands the emphasis, on the question of gas qualities. To enable members to scrutinize my case more closely, I have had a few kettle-boiling tests made on similar lines to those reported by the Gas Investigation Committee in 1918. These are submitted as a schedule. In the text I have always quoted B.Th.U. values gross; but in the tests both gross and net are stated, to show thermal efficiency results corresponding to those contained in the report referred to. Simmance and Abady's total-heat calorimeter has been used, and a gravity bell by the same makers for the specific gravities here recorded. Analyses have been taken by a four-tube Orsat apparatus with a Hempel explosion tube attached. I claim that the tests of gas and the efficiency tests in boiling justify my contention that, mixing good straight coal gas with gas produced by total gasification plant as a diluent, and with no avoidable atmospheric inerts, a 400 B.Th.U. value should prove a popular standard. I am consequently rather surprised at the hesitancy, revealed by the declared values published to date, on the part of gas undertakings to get very near this figure. Of other methods of bringing calorific values down to 400 or thereabouts, the writer does not care to speak—these are in use, and possibly we may hear from some members present. For the purpose of these reflections, I prefer to confine myself to my own experience.

WATER BOILING TESTS WITH GAS AS DESCRIBED.

SERIES A.

Gas used: Mixed gas, 421 B.Th.U. gross, 377 net. Specific gravity, ·562.

COMPOSITION.

CO_2. P.Ct.	O_2. P.Ct.	CO. P.Ct.	C_nH_m. P.Ct.	H_2. P.Ct.	CH_4. P.Ct.	N_2 P.Ct.	Total Inerts. P.Ct.
6·0	1·0	15·2	1·2	48 4	19·7	8 5	15·5

Rate of Consumption, 15 c.ft. per hour.

BURNER A.			BURNER B.		
Gross Thermal Efficiency. P.Ct.		Net Thermal Efficiency. P.Ct.	Gross Thermal Efficiency. P.Ct.		Net Thermal Efficiency. P.Ct.
55	..	61	45	..	50·5

With aluminium kettle.

Burner A—A typical modern burner.

Burner B—A typical pre-war burner, without alteration in mixed gas tests, air inlet covered when using Tully gas.

SERIES B.

Gas used: Mixed gas, 497 B.Th.U. gross, 360 net. Specific gravity, ·550.

COMPOSITION.

CO_2. P.Ct.	O_2. P.Ct.	CO. P.Ct.	C_nH_m. P.Ct.	H_2. P.Ct.	CH_4. P.Ct.	N_2. P.Ct.	Total Inerts. P.Ct.
4·2	0·8	19 0	0·2	49·1	17·5	9·2	14·2

Rate of Consumption, 15 c.ft. per hour.

BURNER A.			BURNER B.		
Gross Thermal Efficiency. P.Ct.		Net Thermal Efficiency. P.Ct.	Gross Thermal Efficiency. P.Ct.		Net Thermal Efficiency. P.Ct.
53·2	..	60	44·5	..	50·5

With aluminium kettle.

SERIES C.

Gas used: Tully gas, 333 B.Th.U. gross, 303 net. Specific gravity, ·562.

COMPOSITION.

CO_2. P.Ct.	O_2. P.Ct.	CO. P.Ct.	C_nH_m. P.Ct.	H_2. P.Ct.	CH_4. P.Ct.	N_2. P.Ct.	Total Inerts. P.Ct.
7·0	0·6	33·2	0·5	48·1	5·6	5·0	12·6

Rate of Consumption, 15 c.ft. per hour.

BURNER A.			BURNER B.		
Gross Thermal Efficiency. P.Ct.		Net Thermal Efficiency. P.Ct.	Gross Thermal Efficiency. P.Ct.		Net Thermal Efficiency. P.Ct.
53·5	..	59·0	36·5	..	40·5

With aluminium kettle.

In preparing the tests presented, Dr. E. W. Smith's apparatus has been used, checked by the Orsat previously mentioned.

During the last few days, I have secured a few tests of incandescent lighting using mixed gas of 409 B.Th.U. and Tully gas of 339 B.Th.U. I had not the opportunity of getting full hemispherical curves, but took, as will be seen, effective candle power at 30° and 45° respectively on different burners, getting the maximum effect within the range of our photometer. Unfortunately it was not possible to get Tully gas to the photometer at a pressure equal to that of the mixed gas; hence the resultant tests are not exactly comparable, and the opening-out of the nipples is somewhat severe. Sufficient is shown in the brief summary below to prove that mixed gas of 400 B.Th.U., as advocated, is effective in lighting, and that typical incandescent gas-burners can be manipulated to maintain largely their thermal efficiency, so long as the required throughput of B.Th.U. can be secured. Also the important relation of gas quality to flame shape and contact in incandescent mantles is well illustrated.

DISCUSSION.

The PRESIDENT (Mr. F. C. Willis, of Tynemouth) said the members were indebted to Mr. Shadbolt for his able paper—especially as they knew it had been prepared under difficulties, and at considerable personal sacrifice of time. The points raised by the paper were of a most important character—particularly the much discussed question as to what was going to be the value of the gas which they should supply. The question of what was likely to be the best commodity for the future was, however, still largely a matter of personal opinion. He had already expressed his view in his address; and he did not propose to say much more before throwing the paper open for discussion. It was certain that thermal efficiencies constituted a very vital thing; but thermal efficiencies were not everything connected with the supply and use of gas. They should remember that there were other things—such as the question of the convenience and easy handling, and the regulation and the use of it by the counterpart of the "man in the street," the user in the house. In the vast majority of cases, the consumer in the house was not the expert of the laboratory; and they should consider this side of the question, if they wished to give the best service they could. It was, after all, their main commodity; and their duty was to sell gas which would attract business. However much they might know, and be inclined to alter and convert apparatus, it was a tremendous task by the wave of a hand to alter apparatus which had been designed for something like 500 to 600 B.Th.U. gas to consume gas of 400 B.Th.U. or lower qualities. His experience led him to believe—certainly in his own case—that 400 B.Th.U. gas was likely to be more difficult to handle than qualities ranging from 450 to 460 B.Th.U. They had to remember that a great deal of the apparatus in use day by day was apparatus which had been purchased beyond their jurisdiction. He did not wish it to be understood that he advocated even 550 or 500 B.Th.U. gas; but he did feel that there were other questions—such as the very fickle behaviour of refractory materials—to come into consideration. These were days, also, in which they were bound to practise economy in every way. They must have an article which would advertise itself in every home; and there was a limit at the present time to how far they might bring their commodity down in quality. He was not going to prophesy regarding the gas of the future; but, in his opinion, there would need to be a very gradual transition from 475 to 400 B.Th.U., or even lower than that. They could sympathize with Mr. Shadbolt in his remarks referring to the difficulty of sending out gas of 275 B.Th.U. gross value; and he could quite imagine the feeling of satisfaction coming, not only to Mr. Shadbolt, but to the consumers in his area, when the quality was gradually brought to normal conditions.

Mr. H. Foss (Thirsk) asked Mr. Shadbolt whether he would recommend the burner [exhibited] with the long nozzle for the use of gas where the pressure was low.

Mr. HERBERT LEES (Hexham) said he felt Mr. Shadbolt's paper had been somewhat in the nature of a bombshell to many at the meeting;

LIGHTING TESTS.

	CO_2. P.Ct.		O_2. P.Ct.		CO. P.Ct.		C_nH_m. P.Ct.		CH_4. P.Ct.		H_2. P.Ct.		N_2. P.Ct.		Total Inerts. P.Ct.
Mixed Gas . .	7·4	..	0·4	..	16·14	..	0·4	..	15·5	..	49·1	..	10 8	..	18·6

Specific gravity, ·362; B.Th.U. 409 gross, 366 net.

	CO_2. P.Ct.		O_2. P.Ct.		CO. P.Ct.		C_nH_m. P.Ct.		CH_4. P.Ct.		H_2. P.Ct.		N_2. P.Ct.		Total Inerts. P.Ct.
Tully Gas . .	5·4	..	*Nil*	..	30·8	..	1·0	..	7 8	..	49·0	..	6 0	..	11·4

Specific gravity, ·601; B.Th.U. 339 gross, 306 net.

Burner Tested.	Gas Used.	Gas Pressure.	Consumption per Hour.	Angle.	Candle Power.	B.Th.U. per Candle-Hour.	
						Gross.	Net.
		Tenths.	C.Ft.	Degrees.			
Light Bijou Cluster.	Mixed	40	6·6	45	294·0	9·1	8·9
Ditto	Tully	18	5·4	45	155·0	11·8	10·7
Universal Inverted	Mixed	40	5·0	30	75·6	26·3	23·5
Ditto	Tully	14	4 6	30	57 0	28 0	24·7
Ditto with Patent Nozzle and Mantle . .	Mixed	40	3·8	30	57 5	27·0	24 1
Ditto	Tully	14	4·5	30	65·0	23·4	21·2
Midget Inverted.	Mixed	40	1·5	45	19·8	31 2	28·0
Ditto	Tully	20	2·2	45	19·2	38·8	35·1

and they had not quite recovered from the shock. He believed, if they carried their minds back to the anxious period of the coal strike, and if they had any records at all, they would know that on more than one occasion they approached very near, if not quite so low as, the figures given by Mr. Shadbolt. He was quite satisfied in his own case that there were times when they were down to 400 B.Th.U., though never to 350 B.Th.U., so far as he knew. But for long periods they were down to 400 B.Th.U.; and he did not think the consumers had found much serious inconvenience in the circumstances. Within the last few days, he had seen a district lighted with gas entirely by the plant referred to by Mr. Shadbolt; and the highest quality of the gas could not be more than 350 B.Th.U., and probably nearer the figure he stated—330 to 340 B.Th.U. He saw it as an ordinary consumer—in use for gas-fires, for boiling-rings, for domestic lighting, in a public room, and on the streets. Immediately after leaving the town, he passed through two other districts where the quality of the gas was known to be considerably higher—he should say it was about 450 to 500 B.Th.U.—and, so far as street lighting was concerned, there was no discernible difference to the eye. He was quite satisfied that in the low-quality gas district the street lighting was as good as the other, though he had no figures as to what the consumption was. The fact which impressed him, however, was that it was possible to supply a district with this quality of gas. He was not suggesting that he was going to adopt it right away; but if circumstances were favourable in every other direction, he would not say that he would hesitate to consider it. He thought it quite possible to work-down to 350 B.Th.U., at any rate, and still give satisfaction to the consumer. There would be, he recognized, great difficulty in a district like that they were meeting in, where the whole apparatus would have to be altered in a short time; but that the consumer could be met satisfactorily with such a gas, he was now convinced. There was another point in connection with the question of the calorific value to be declared. He had noticed in a discussion at another place that some undertakings were declaring a calorific value which differed greatly from the British thermal units supplied. They should declare a calorific value as near as possible to what they intended supplying. In some cases low grades would be most economical, and in others something higher. Not so long ago, 450 B.Th.U. was considered a low value to declare; but, in his judgment, this was not now too low, and something less even could be satisfactorily supplied.

Mr. A. W. BRANSON (West Hartlepool) thought there was no difficulty in burning gas of any calorific value, providing the apparatus was made to suit. In South Wales, when he was there, they supplied coke-oven gas often below 420 B.Th.U.; but all apparatus, cookers, &c., were provided with adjusters. The lighting was splendid. One could not have wished for better lighting and efficiency from the gas. During the coal strike there, they were forced to turn on the water gas; and the lighting was satisfactory. At Hartlepool, during the recent strike, they had supplied carburetted water gas, and nothing else; and they had got through very well indeed. There was some adjustment to make, as they had been supplying 520 B.Th.U. gas prior to that; and during the strike the quality was reduced. They used 2·2 gallons of oil per 1000 c.ft., and sent out 470 B.Th.U. gas; but the air had to be adjusted. The day before the meeting they had carried out certain alterations which necessitated stopping for most of the day; and they had sent out 80 to 90 p.ct. of water gas without any difficulty—it was simply a matter of adjustment. However, the quality of gas to be supplied would have to be considered from the financial standpoint. The price of oil was a determining factor as to what quality would pay. They could not dogmatize on this matter. They wanted elasticity. They should not be bound to a certain quality, but should design plant so that they could vary it by bringing it down or putting it up. It might pay many to put it up, and carry as many therms as they could. However, he had quite an open mind on the question for the time being, but thought the best figure was 470 B.Th.U. This was because at his own plant and works this figure suited best. It was all a matter of the plant one had.

Mr. A. C. HOVEY (Blyth) remarked that during the strike Mr. Shadbolt was relieved from the careful attentions of the authorities, who acted as the protectors of the consumer in the same way as Government officials were the protectors of trade. He thought when Mr. Shadbolt expressed the view that the lower the heat value per cubic foot the cheaper the cost of production per thermal unit should become, he was expressing a view that was very widely held now by gas engineers in this country. Mr. Shadbolt had spoken freely of experiments on full working scale—unrestricted by meticulous regulation—in the useful direction he wished to pursue, while the opportunity offered. He had presented figures relating to steaming in horizontal retorts at South Bank. In 1916, without steaming 12,000 c.ft. of an average quality of 525 B.Th.U. (or 63 therms) were produced per ton of coal. In 1918, with steaming the production was 15,750 c.ft. of 437 B.Th.U. quality (68·9 therms). The increase due to steaming was thus only 5·9 therms, or 9·3 p.ct. At the works of the Blyth Gas Company, with which he (Mr. Hovey) was identified, the output from horizontal retorts in 1916 was 11,500 c.ft. of 525 B.Th.U., or 60·3 therms. During the recent coal strike in continuous vertical retorts, more than 1600 tons of stock coal produced per ton 21,380 c.ft. of 425 B.Th.U. quality, or 90·86 therms—an increase of 30·56 therms per ton of coal, or 48·9 p.ct., against only 9·3 p.ct. therm production increase due to Mr. Shadbolt's steaming in horizontal retorts.

Mr. T. P. RIDLEY (Newcastle) congratulated Mr. Shadbolt upon his paper. It could be divided, he said, into two parts—first, his experience during the strike, and, secondly, the impression left upon his mind that it was desirable to declare a lower calorific value than was generally being declared at present. He wished just to touch upon the financial aspect. Regarding their experiences during the coal strike, the Government pressed the gas companies and corporations with gas undertakings to do their utmost to keep going; and, as Mr. Shadbolt had said, the gas industry came out of the strike as having performed a great service to the public. When the Government were pressing the gas companies to keep going, they held a carrot dangling before them; but when they came to the end of the strike, this carrot disappeared. [Laughter.] They were sorry for the gas undertakings, and offered sympathy. At the same time, the losses were enormous. In the case of Newcastle, the loss was over £50,000; and these losses would have to be made up in one way or another. It meant either increases in the price of gas to meet the losses, or continuance of the present prices for a longer period than would otherwise have been necessary. The public appeared to have forgotten these losses, to ignore the question of the fulfilment of pre-strike contracts, and complained when the undertakings put up the price or continued at present high rates. With regard to the question of calorific values, it really depended upon the circumstances of each case; and that gas which was a good proposition for one, was not necessarily good for another. What, in his opinion, was needed was to keep in view a flexibility of method; and a further point to have in mind was the market for coke. It should also be remembered that the cost of production in the retort-house was not the only factor. There was the question of the capacity of the purifying plant, station meters, gasholders, mains, and service and interior pipes, which in many cases were already too small. It should be remembered, too, that with a low-value gas there would not be in some cases as large a sale of therms, owing to the existing appliances not taking as large a throughput of therms in low grade as against a higher grade. The therms might be wanted by the consumers; but the appliances would not take the desired throughput.

Mr. SHADBOLT, replying, said he was now free to admit that he had deliberately tried to provoke a discussion, because he believed that there were times when "open confession was good for the soul"—professionally, as well as privately. The strike had given them the opportunity for open confession on some matters in a way that had never been paralleled in the past. The President had said that the thermal efficiency of gas was not the only point. Well, there was a long stretch of leeway to make up in this direction; but he personally did not see any vital hindrance to the dropping of the B.Th.U. as low as he had gone. Existing appliances were, after all, his limit; and he tried to make this clear. Granting his first premise, that the lower they went in calorific value the lower should be the production costs, then the logical stop came when the existing apparatus would not take it. The second speaker had asked whether he would recommend the longer nozzle burner at low pressures. He would certainly say, "Yes." He was pleased to hear the remarks as to lighting efficiencies on low-grade gas. Nobody challenged this submission. There was one little point raised by Mr. Branson, and again by Mr. Ridley, and that was the question of residuals. Whether he was old-fashioned or new-fashioned, he, personally, felt very strongly convinced that the success of their industry was largely wrapped-up in considering themselves first and foremost as gas suppliers and gas makers. Though he lived where residuals played "ducks and drakes" with him, it was no excuse for his letting the residuals come first. He thought the demand as a whole, and as a national industry, should pin them down more closely to gas first and residuals afterwards. This was one of the points from which he approached the question. He understood Mr. Hovey's remarks to suggest that the strike compelled a lack of vigilance, and that they were relieved in this way. He thought, however, the correct point of view was that the strike compelled them, in self defence, to go out and stretch to the limits. He welcomed the opportunity they had to do things they would otherwise not have been able to do. He agreed with Mr. Ridley that the financial aspect was the crucial test.

Comparison of a Preheated Air Furnace with a Direct Fired Furnace.

Mr. O. Lellep has contributed a long article to the "American Gas Journal," in which he records the results of much experimental work to decide whether it pays to preheat air for town's gas-fired furnaces. He points out that the saving of fuel due to pre-heated air depends largely on the working temperature of the furnace and the temperature of preheat. The saving of fuel is almost proportional to the temperature of preheat. Generally it does not pay to use preheated air for town's gas in furnaces working below 1800° Fahr.—particularly with furnaces having an average gas consumption below (say) 500 c.ft. per hour. Air preheating is more justified for high-temperature furnaces working at 2000° Fahr. or more, provided the waste gases can be directed into the heat-exchange system, and the furnace is consuming over 500 c.ft. per hour. Cast-iron recuperators have a short life, if used above red-heat, and therefore cannot be used efficiently at higher temperatures, where the air preheating is most advantageous. In a furnace at 2600° Fahr., a reversible regenerating checker-work air preheater may result in twice as much fuel saving as a cast-iron one. The claims raised in connection with air preheating are often misleading. Before introducing a system which means complication of the equipment, and extra expense for upkeep, one should be sure that a modern direct-fired furnace is less economical. Surveying the field of possible application, he thinks it looks safe to say that in most cases air preheating does not pay for industrial town's gas furnaces, though there are some few attractive prospects as exceptions to the general rule.

Tempered Copper and the Gas Industry.—Discussing in the "American Gas Journal" a recent report that the age-old problem of making a hardened copper has been solved, Mr. Ismar Ginsberg, B.Sc., says that though, as far as can be at present seen, this is hardly in request by gas men as a metal, they may have another interest in it. The process by which the new metal is obtained is a thermal one; and there is no reason why gas should not be used for this purpose to very great advantage. It rests only in the construction of the furnace wherein the heat treatment takes place. While admitting that the whole thing may be a hoax, the writer urges that there is no use waiting until the rumour is confirmed by the actual appearance of the metal upon the market, for then it may be too late. It will be well to find out in time what there may be in the matter, and run it to earth.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

At the invitation of Mr. J. Banbury Ball, the Corporation Gas Engineer, the members of the Association visited the Rochdale Gas-Works last Saturday afternoon.

On arriving at the works, the members were received by Mr. Ball and Mr. J. B. Stewart, the President of the Association. The party was divided into four groups, three for the manufacture and chemical plant and the fourth for the distribution department—workshops, meter-repair shops, and stove showroom situated in town. The guides were Mr. Ball and Messrs. Stewart, Mellor, and Hailstone. After the visits the parties assembled at the Town Hall, where they were entertained to high tea. The Gas Committee were represented by the Mayor (Alderman H. Clark), Alderman J. Blomley, the Chairman of the Committee, and Councillors J. H. Lord, T. E. Kershaw, T. W. Woffinden, B. Schofield, J. W. Dutton, and A. Clarke.

The MAYOR said he was pleased to welcome the members to Rochdale. It was a noted place, and they at Rochdale were very proud of their town. Mr. Ball and his assistants had the full confidence of the Gas Committee, and he assured the members that they were welcome to the town that afternoon.

The PRESIDENT, in reply, said it gave him great pleasure to speak on behalf of the Association. When he approached the Engineer on the matter of a visit, Mr. Ball said he was only too pleased to do what he could to forward the objects of the Association in any way.

Mr. GEO. DIXON, A.M.Inst.C.E. (the Junior Vice-President), proposed a vote of thanks to all those who had made the visit so successful. He said he was pleased with the new feature that had been adopted that afternoon in dividing the party into technical groups, so as to permit of a much closer attention to any particular subject that appealed to a member.

Alderman J. B. BLOMLEY welcomed them on behalf of the Gas Committee. They as a Committee were anxious to make the Association welcome. They were proud of their Engineer and his forty years' service. There was no man in the town more respected.

Mr. BALL, at the call of the President, said he made no pretensions that they had anything new, as during the last eight years there had been no inducement to either extend or embellish the works. Yet through it all they had managed to keep going and make gas. In conclusion, he said his forty years' service had made him very much attached to the townspeople, who had shown him so much kindness.

After an interval of a few minutes the ordinary business of the Association was proceeded with.

The TREASURER read the balance-sheet and it was approved.

Messrs. C. Kay (Bury), H. D. Robinson (Padiham), and H. B. Knowles (Lancaster) were received as new members.

The PRESIDENT then read his

PRESIDENTIAL ADDRESS.

At various times I have been asked by many of our members the question, "What does the gas profession hold in prospect for the junior of to-day?" As the subject is eminently suitable for an address of this nature, I feel constrained to take a look into the future, and lay before you my thoughts. They may help the optimist in our Association to be more of an enthusiast, and may convert the pessimist to a more roseate view of the future. To me the prospect is an alluring one. When comparing the advantages that we possess to-day with those in existence thirty years ago, it will be observed what strides have been taken to raise the educational standard and consequently the status of those engaged in the gas profession. Thirty years ago there were no Junior Gas Associations, no organized theoretical education, and no organized practical training; the result being that while some of the chief executive and administrative posts were held by men who had received specialized training to a certain extent, the opportunities for such training were not so general as to enable everyone who wished to take advantage of them. Might I say at this point that, in spite of the want of specialized training, the engineer of the past decade has proved that by application and hard work this deficiency can be overcome to a great extent, and that it is greatly to his credit that the gas profession is in the high position it occupies at the present time. To-day the student has only himself to blame if he neglects the means that lie to his hand of making himself efficient—the need for being trained specially with the view of entering the profession is more than ever borne in on one by the increased changing conditions in the manufacture and supply of gas. The chief executive and administrative posts will undoubtedly be filled in the future by men who have entered the profession from school and college specially trained for this particular business.

The first duty of the junior then is that of educating himself theoretically by taking advantage of all channels of information available. In this connection the work of the Junior Gas Association plays a very large part in the education of the junior. The meetings with varied discussion on technical and other matters relating to the profession, the visits to gas undertakings and works engaged in the manufacture of gas plant and appliances are a real benefit; and the junior should be encouraged by the responsible officials of the undertaking in which he is engaged to interest himself in the Association and its work. Then I might draw your attention to the education scheme which representatives of the Joint Council of the English Junior Gas Associations have been working at for some time back, which has been submitted to, and to a certain extent has received the imprimatur of, the Institution of Gas Engineers. There are still difficulties in the way of launching this scheme, difficulties which probably would have been overcome if there had not intervened the coal dispute with all its unfortunate results. The educational course outlined in the scheme would be the student's first step, after matriculation, in conjunction with his practical training in the service of a gas undertaking. It is comprehensive, covering the whole field of work in the profession, and a stiff training is set for the student; but the great point about it is that he takes the course immediately after leaving school or college, while his mind is receptive, and the benefits to himself and to the profession in the long run will more than recompense him for the hours he has spent in study. At the present time and in the past, the London City and Guilds are doing and have done valuable work in the theoretical training of the junior; and the course for these examinations may be taken by the junior in or near the large centres at the nearest technical college, or by the country student in correspondence classes conducted by a teacher of standing. There will be rather more difficulty in getting the same comprehensive training on the practical side, especially with the larger undertakings. The junior, on being engaged by or articled to a small undertaking, would have no difficulty in keeping in touch with the practical side of the commercial, manufacturing, and distribution departments of the business, besides getting some insight into the management and chemistry of gas-works practice; but in the larger undertakings where every branch is specialized, there would not be the same opportunity for an all-round practical training. Of course, if the junior is an articled pupil, the difficulty is surmounted even in the larger undertakings; but this does not help the student who wishes to enter the profession and cannot enter as an articled pupil for reasons of economy or otherwise. However, this difficulty will eventually solve itself by process of evolution, and when opportunities become more equal. We find to-day some managers are only too willing to grant the junior who is enthusiastic in his work the facilities necessary to enable him to get a comprehensive grasp of the practical side of the whole business.

The great necessity of the profession is the same as in other technical and commercial professions—namely, the necessity for specialization. You have noticed that the student is being asked to study subjects which embrace the entire business of the profession; and this study is necessary if he is to be successful at a later date. Immediately his educational course is completed, he has to decide what part or side of the profession he intends to specialize in. Here again he may be up against some unforeseen trifle, and may be unable to follow the line that he feels is his natural bent. But let him remember that while specializing in one particular line all sides of the profession are correlative to one another and form the whole. The man on the distribution side who has some knowledge of the troubles on the manufacturing side is less likely to grumble at getting from the districts complaints of variable pressure or variable quality, while the man on the manufacturing side who has some knowledge of the troubles on the distribution side is more likely to try to avoid variations of pressure and quality; the general knowledge thus leading to greater harmony in working.

Thus far I have kept to the education or the opportunities for education afforded to the junior. But what does the future hold for him? What avenues are open to him to employ the knowledge which he has gained, and to employ it profitably to himself and his adopted profession? On looking round, one is astonished at the number of things which can be done. Take the manufacturing side. In carbonization you have what is of paramount interest at the present time—namely, the problem of getting the greatest number of B.Th.U. possible out of the coal, and thus making for the ultimate goal of total gasification. The various methods of carbonization having been studied, the junior will be ever on the look-out for improved methods and results; and great as have been the improvements in recent years, greater still are bound to come from special study and training. On the distribution side, I am on safe ground when I say that except for some of the larger undertakings this part of the work has been lost sight of altogether. The people who sell the gas, what of them? Have they really studied their subject? Sometimes I doubt if they have. The first thing that strikes one in this connection is the inadequacy of mains and services, due to a certain extent to the changed conditions of supply. When we read in the Technical Press reports regarding undertakings in this respect, we feel there is a job for the distribution man with some vision. Then there is the question of maintenance. I heard an engineer remark some time ago "that if he could work out a maintenance scheme which would be economically sound, he would put it into operation at once." There is also the distribution of low-grade gas, which in the near future will tax the capabilities of the man who is responsible for the selling of it. On the commercial side, for the junior with a bent in this direction there is costing and various other subjects waiting to be still more efficiently handled. My predecessor in this chair, Mr. J. Bridge, of Elland, submitted to us an excellent and instructive address on costing, showing the very great economies which could be effected by the knowledge derived from some such system. More in this direction can be done than has been. Then there is the chemical side. Take research work, for instance. In this field the number of small (yes and large) economies that could be effected by capable men is greater than one could well imagine; the very simplest of tests on works

plant will reveal inaccuracies in working due to faults in the plant which could not be detected in any way other than by these tests. The distillation of tar, the manufacture of the many valuable bye-products, and testing for efficiency of the many gas appliances in use on the district—these are all avenues for the man on the chemical side. Then under the Gas Regulation Act the chemist is more necessary to the profession than ever he was before; and as his value increases, his status is rising.

I think I have given sufficient examples to show the great need first of all for a good general training, and secondly for specialization by the junior. I shall now try to answer the question of the junior's future, probably from the point of view which interests him most. He asks, "Where and what is the reward for the years spent in study and application? Is there any appreciable difference in the remuneration and conditions of service between the present day and thirty years ago?" To the latter question, the answer is in the affirmative. While the members of the profession are still in many cases inadequately remunerated for the service rendered to the community, the reason for this is attributable to various causes—not so much supply and demand, but the general status of the profession, and often the unselfish devotion of the engineer of the past to his undertaking in carrying out the executive and administrative duties of the undertaking, believing that the work well and truly done was its own reward. There are other reasons, but these are sufficient for my purpose to-day. An eminent gas engineer remarked at a meeting the other day that "before the status of the profession could be raised, the remuneration would have to be higher, so as to attract the young men who had received the higher education and training." To a certain extent this may be true; but the fact of the matter is this: That the junior himself is responsible for the raising of the status in the profession; and so long as the members of the Junior Gas and kindred Associations continue the educative work in which they are engaged, the work in itself will bring recognition. The necessity for having more highly trained men in the profession will undoubtedly have the tendency of raising the remuneration all round. It is impossible for every junior to become the chief executive officer of a gas undertaking; but it is his duty to equip himself for the position should such an opening occur. Perhaps it is just as well that we cannot all be managers, as the profession requires its specialists in its engineering, distribution, commercial, and research departments.

Our profession has often been unfavourably compared with the electrical profession in reference to remuneration, and perhaps justly so; but we must not overlook probably the main reason for this—that the electrical profession is younger than ours and has developed so rapidly that there has always been more or less a shortage of men qualified to fill the chief executive positions, and that the rapid development of electrical supply undertakings has been made not so much by the work of the undertakings themselves as by demands made on them for power purposes. On the other hand, the advance in the development of gas supply undertakings in the last decade has been made by the profession itself in creating new fields of supply. There are still other fields, and it is in the enthusiasm of the junior of to-day that we can hope for the cultivation of these fields in future. We were all advised when young that the best way to get on in the profession was for us to make ourselves indispensable to the undertaking we served. Literally this is impossible; but we must do our best for the undertaking, not only for its but for our own benefit. If I might be allowed to tender a little advice in return for the many advices and admonitions I have received, the advice would be "Do not allow the particular undertaking you serve to become indispensable to you." In an address to the Scottish Juniors (Eastern District) Mr. J. W. M'Lusky, the General Manager of the Glasgow Corporation Gas Department, advised the junior when he got to a particular stage in an undertaking to get out of it, both for the sake of the undertaking and for his own sake as well. This is sound advice if it could always be followed; but many a time it is impossible, on account of causes ofttimes economic. It is only reasonable to suppose that the more independent a man is in every way, the more likelihood there is of his giving of his best in his adopted profession.

It is up to the junior himself to make the future of the profession worth working for. In this connection I would like to say that, whereas no amount of encouragement from his chiefs will make the unenthusiastic junior interested in his work, the very smallest amount of encouragement will strew the enthusiastic junior's path with roses. I take this opportunity of asking those who are in a position to help the junior, to give him every possible facility in the way of study, and to encourage him to join Associations like the Junior Gas Associations. Then the future of the junior and the future of the profession will be greater than ever.

Mr. J. BRIDGE (Elland) moved a vote of thanks to the President for his address, and said he was glad that a distribution man was this year in the chair. He suggested that the members would be well advised to go fully into the matter of distribution, as they would find it of great interest and profit to them and the department they served. He also complimented Rochdale on the efficiency of its distribution department.

Mr. E. NICHOLSON (Stretford) seconded the vote.

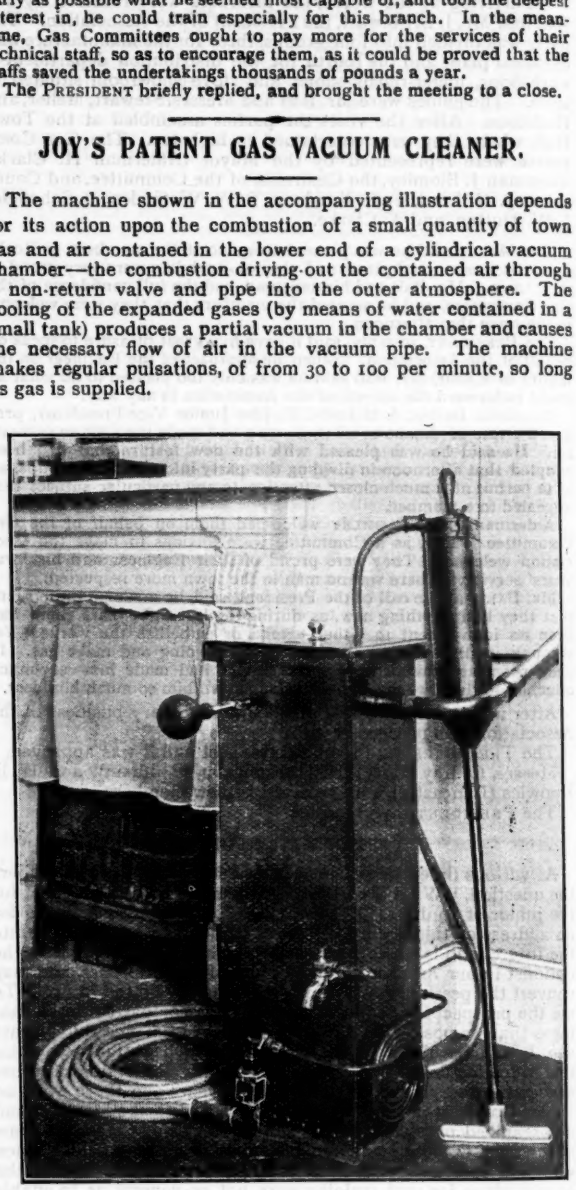
Mr. BALL supported it, and expressed his pleasure at being able to speak a few words on the work their President had done since he crossed the border. He spoke of the difficulty of convincing Gas Committees generally that the gas should be followed up to the consumer, and more attention be given to afford him entire satisfaction. He thought gas undertakings would greatly benefit by going on these lines. He was glad their President held the same views.

Mr. T. DUXBURY (Oldham) said that some years ago he called attention to the fact that those gentlemen who dealt with distribution matters could very well be styled Distribution Engineers, as the work they did oftentimes called for engineering skill. He reminded his hearers that they could not all be engineers and managers, as there were not vacancies sufficient on the one hand, and again all were not cut out for this particular work; so that if each youth would ascertain as early as possible what he seemed most capable of, and took the deepest interest in, he could train especially for this branch. In the meantime, Gas Committees ought to pay more for the services of their technical staff, so as to encourage them, as it could be proved that the staffs saved the undertakings thousands of pounds a year.

The PRESIDENT briefly replied, and brought the meeting to a close.

JOY'S PATENT GAS VACUUM CLEANER.

The machine shown in the accompanying illustration depends for its action upon the combustion of a small quantity of town gas and air contained in the lower end of a cylindrical vacuum chamber—the combustion driving out the contained air through a non-return valve and pipe into the outer atmosphere. The cooling of the expanded gases (by means of water contained in a small tank) produces a partial vacuum in the chamber and causes the necessary flow of air in the vacuum pipe. The machine makes regular pulsations, of from 30 to 100 per minute, so long as gas is supplied.



The cleaner is connected by a flexible (⅝-in. dia.) pipe to a light dust container and nozzle weighing about 2 lbs. The nozzle is of the usual small dimensions of the hand-machine nozzle, so that it can be operated under tables, chairs, &c.—in fact, under such conditions as are invariably found in the living rooms and bedrooms, &c., of a modern flat. The dust does not pass through the pipe, so that there is no possibility of a stoppage—air only, after filtration, passing along it.

Less than half-a-minute suffices to put the machine to work. The working pressure does not exceed 4 to 5 lbs. per sq. in.; and the vacuum reaches 4 or 5 in. of mercury—a higher degree of vacuum than is obtained with most electrical and hand machines, and one that ensures the dust being effectively drawn out of a carpet.

The vacuum chamber is contained in a small water-tank; and, while the water keeps the chamber cool, the water itself becomes heated. The tank can be of such proportions that after (say) twenty minutes' or half an hour's vacuum cleaning three or four gallons of hot water for washing-up or other domestic purposes would be available. Thus the machine combines the advantages of a vacuum cleaner and a water heater; and the working cost is only about a shilling per week, with gas at 4s. per 1000 c.ft.

A machine installed in a flat has been in practical operation for more than a year. It is invariably started in less than half a minute; and there has not been one involuntary stop during the whole period of its use.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents]

How to Burn Coke.

SIR,—Mr. Marshall's letter in your issue of the 5th inst., is again interesting reading; but it still fails to clear-up my difficulty. Mr. Marshall attributes to me a degree of modesty to which I fear I cannot lay claim. I did not say that I was not clear "about sensible heat and thermal reactions." I rather thought that I was clear about them, or I should not have ventured to write.

What I said was that it was not clear to me in what consisted the advantage of what Mr. Marshall calls the producer process, over the direct combustion of carbon to dioxide; and Mr. Marshall's letter throws no light on this. He speaks again of the "sensible heat evolved by the conversion of CO_2 to CO;" but, in his subsequent calculation, he (quite rightly) states that this reaction does not evolve heat, but absorbs, on the scale of his calculation, 38,000 calories.

The final result of his series of processes is that 48 lbs. of carbon yield 195,200 calories; while direct combustion of the same amount of carbon to carbon dioxide also yields 195,200 calories. Why, then, must we use a deep fuel bed, and carry on the producer process? Not, apparently, for reasons connected with the amount of heat evolved, since that is the same in either case. And I cannot see why the heat evolved by direct combustion to carbon dioxide should not be "imparted to the shell" quite as successfully as the "exothermic sensible heat of the CO_2 reduction," which it now appears is a negative quantity. Can Mr. Marshall clear my vision here? J. T. DUNN.

Public Analyst's Laboratory, Newcastle-on-Tyne, Oct. 8, 1921.

Neutral Sulphate Manufacture.

SIR,—I was interested in reading (in your issue of the 28th ult.) Mr. Hansford's paper on the manufacture of neutral sulphate of ammonia. Having had the privilege of seeing the plant in operation, I can testify as to its simplicity, ease of working, and general efficiency in producing a good grey neutral salt in an excellent physical condition. In my opinion the process is eminently suitable for small gas-works plant using a good-quality acid. In this latter respect, Mr. Hansford is particularly fortunate, as shown by the high degree of purity of his salt.

Unfortunately, however, the process does not appear to be applicable to general gas-works and coke-oven practice. An essential condition for the success of the Bedford process is the maintenance of a thorough agitation and circulation of the contents of the bath, more especially when the neutral point is being approached. With small saturators of the hand-fishing type, this is easily accomplished; whereas in large units of the more modern type, the efficient mixing of the deposited salt and liquor becomes a much more difficult operation. It is hard to see how, in the case of large saturators, alkaline zones (with consequent fixation of cyanogen compounds and discoloration of the salt) are to be entirely avoided.

In the "direct" and "semi-direct" processes of ammonia recovery—as practised on coke-oven plants—it has been my experience that working at too low an acidity of the bath inevitably leads to the formation of rock-salt and blockages in the saturator; while discoloration of the salt is a frequent occurrence under such conditions, in spite of the fact that the bulk of the liquor in the saturator shows an acidity of from 2 to 3 p.ct.

Further, in any plant (particularly large plants), the charges incurred for extra labour, power, stores, and repairs, interest and depreciation, should not be ignored. Mr. Hansford refers only to the cost of gas for drying. ARTHUR W. WILLIAMS, B.Sc.

Semet-Solvay Coke-Oven Company, Sheffield, Oct. 4, 1921.

"Gas Supply" Examinations.

SIR,—I regret that my strictures on the lack of knowledge shown by *some* of the students in "mains and main laying" in their answers to my questions last May should have been styled undeserved by Mr. R. G. Marsh.

As I saw the papers, I rather think my judgment is the more likely to be correct. With reference to No. 2 Question, I find from my records that all those students who secured a first-class pass answered this question in a satisfactory manner; so that they at all events did not require additional data.

I am at all times willing to accept suggestions; but I hardly think Mr. Marsh's letter will help me in my work. H. KENDRICK.

Stretford, Oct. 7, 1921.

Complete Gasification of Coal.

SIR,—I have been asked to explain what I mean by the complete gasification of coal; and as it is well to be quite clear, or as explicit as one can be, when using words in place of mathematical symbols, I shall try to define my meaning. It is not, of course, that one should obtain nothing but "gas and ashes" from the coal. I understand it to convey that one should obtain the maximum possible thermal value of the coal in its most useful and efficient form; and this can best be done by combining the gasifying of the coal with the sensible heat of water gas made from the coke and utilizing the bye-products to the fullest possible extent.

Producer practice has been reduced to a fine art; and the very high thermal efficiency—from 90 to 93 p.ct.—obtained shows that the limit is approached. But what do we find in ordinary gas-works practice? It has been shown that the total heat required to carbonize coal is from 2½ to 3 p.ct. of the thermal value of the coal. In the best results obtained from ordinary retorting methods, 10 to 12 p.ct. is required. There is here large scope for improvement; and it is to avoid this loss that some of the ablest investigators of the day have been working. A system has now been evolved by which the necessary heat interchanges and chemical reactions have been arranged to give an over-all thermal efficiency in the gasifying of coal of about 93 p ct, instead of the present best, which does not exceed 70 p.ct.

In the present state of industry, the consequent lowering of the price of coal owing to increased efficiency in using it is of extreme importance; and any process which will lower it will hasten the revival for which most people are anxiously waiting. Some time ago, a prominent gas engineer told me that his coal cost him ¼d. a ton; and this struck me at the time as being pretty cheap. I can now state that, given suitable conditions, which practically resolves into working on a sufficiently large scale, I can present this gentleman, or any of his friends, with 35,000 c.ft. of 380 to 400 B.Th.U. gas per ton of coal gasified for less than ¼d., and without carburetting. This can be done by gasifying the coal on scientific principles in an improved form of retort; the bye-products and cheap power obtained being sufficient to cover the cost of the coal, interest, and depreciation on capital and labour.

Looking at the problem from the broad national basis, the resulting lowering of the price of coal to industry, the inevitable cheapening of the cost of power, and gas, and the improved over-all national efficiency, will be considerable. Many gas-works have bye-product plants which could be worked at their maximum efficiency if they were organized on a district basis. Very often bye-product plant does not pay, due to local conditions being unfavourable. A very important feature of this retort, which I do not think is shared by any other high-efficiency system of gasification, is that any class of coal can be used without injury, the results depending naturally on the quality of the coal. For the majority of gas undertakings, the best thing they can do, as they are doing in large numbers, is to press on with the complete gasification of coal as quickly as they can.

Just as I had finished writing this letter, the "JOURNAL" came to hand; and I congratulate you on your excellent leader on the "Co-ordination of the Economical Provision of Light, Heat, and Power," with which I am in entire agreement. While it is an axiom that "competition is good for trade," due to its stimulating effect, there is no reason why the gas and electricity industries should not co-operate in economizing coal.

In a previous letter, I have said that I had determined "to get to the root of the matter." I might have said that I had determined to exact the highest efficiency in the use of coal, which has been the mainspring of this country's past prosperity and development. Other countries have successful undertakings operating gas and electrical schemes under the same administration, and with very considerable economy. P. SANDFORD.

47, *Victoria Street, S.W., Oct. 8, 1921.*

Reduction in Price for Industrial Purposes and to Prepayment Consumers.

SIR,—With a view to assisting toward the much-desired revival of trade and industry, the charge for gas used for industrial purposes, from July 1 last, has been reduced by 9d. per 1000 c.ft. This will make the price of gas used for trade purposes 3s. 7d. to 3s. 5d. per 1000 c.ft. In addition, the price of gas to prepayment consumers is reduced 8d., from 5s. 3d. to 4s. 7d. per 1000 c.ft.

These reductions are made in anticipation of lower costs, as the Board feel the time has arrived when a determined effort should be made to reduce costs, even at some sacrifice, so that the present trade depression, with accompanying unemployment, may be lessened.

J. FERGUSON BELL.

Derby Gas Light and Coke Company, Oct. 8, 1921.

A Satisfactory Report at Abercarn.

When the report on the gas undertaking for the twelve months ended March 31 last was presented to the Abercarn Urban District Council, it was accepted as being highly satisfactory and as reflecting the greatest credit on the Gas Engineer (Mr. Thomas Wilkinson). Accordingly, they placed the following upon their minutes: "The Council tender to the Gas Engineer their best thanks and congratulations for the successful year's working under the difficult conditions which prevailed—notably the high cost of coal, wages, &c., and the poor quality of coal from which the gas was made. The Council are of opinion that the satisfactory financial result is due to the unflagging energy of the Gas Engineer in trying to find the best means to run the works on the lowest possible cost consistent with efficiency." The report of Mr. Wilkinson showed an increase of £657 in the gross profit, at £2854; the net profit being £384, as compared with £143 a year ago. The make of gas per ton of coal was 11,932 c.ft.—a slight falling-off, owing to the poor quality coal. The sale of gas continues to increase, and in the year under review reached 41¾ million c.ft. The installation of a Tully plant—which was put into operation last May, and has since worked very satisfactorily—saved the position during the coal trouble, and by enabling the postponement of retort renewals led to a considerable monetary gain.

Additional Street Lighting at Bradford.—The Special Joint Sub-Committee appointed by the Bradford Finance and Gas Committees to deal with street lighting, recently declined to grant the request of a deputation from a branch of the National Union of Railwaymen for the provision of illumination after 11.30 p.m., when street lamps are at present extinguished, on the ground that the cost would be too heavy. Last week, however, on reconsideration for a third time, consequent on pressure from other quarters on behalf of night workers, the Sub-Committee decided that during the four months Nov. 1, 1921, to Feb. 28, 1922, in addition to the present public street lighting up to 11.30 p.m., 2030 single-burner lamps be left lighted all night, at an estimated cost of £2000.

MISCELLANEOUS NEWS.

GAS REGULATION ACT ORDERS.

There have been forwarded by the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Godalming Gas and Coke Company.

After the declared date—(1) the standard price in respect of gas supplied by the undertakers shall be 17·6d. per therm; (2) the prices of 15·8d. and 17d. per therm respectively shall be substituted for the prices of 4s. 3d. and 4s. 9d. per 1000 c.ft. mentioned in section 23 (price of gas with sliding-scale as to dividend) of the Godalming Gas Order, 1904.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five. (Oct. 5.)

Midsomer Norton Gas and Coke Company, Ltd.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 17·8d. per therm. (Sept. 30.)

Ryde Gas Light Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 18d. and 19·2d. per therm; and these prices respectively shall be substituted for the prices of 3s. 6d. and 4s. per 1000 c.ft. mentioned in section 36 (sliding-scale) of the Ryde Gas Act, 1904.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half. (Sept. 30.)

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications by gas undertakings to the Board of Trade for Orders under section 1 of the Gas Regulation Act.

British Gas Light Company, Ltd. (Holywell and Whitford).

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 9½d. per therm.

Dorchester Gas and Coke Company, Ltd.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 6d. per therm.

Gosport Gas and Coke Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 6d. per 1000 c.ft. within the urban district of Gosport and Alverstoke, with an addition of 6d. outside this area; and the figures they have asked the Board of Trade to substitute for these are 1s. 6d. and 1·4d. per therm.

Llantrisant and District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 4d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 20d. per therm.

The undertakers have also asked the Board to substitute the price of 19·8d. per therm for 4s. 3d. per 1000 c.ft., which the undertakers are now authorized to charge for gas supplied for public lighting.

St. Annes-on-the-Sea Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 9d. per therm.

Yeovil Town Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 6s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 11·02d. per therm.

DECLARATION OF CALORIFIC POWER.

Harwich Gas and Coke Company.—450 B.Th.U. (Dec. 20.)

BIRMINGHAM CORPORATION ACCOUNTS.

There has been received from Mr. Arthur Collins (City Treasurer) a copy of the Birmingham Financial Statement for the year ended March 31, 1921, which shows that the total revenue of the Corporation during the year under review was £13,048,423; the expenditure, £13,149,261. These figures, of course, include the trading accounts of the Corporation. The receipts on account of the borough fund were £5,285,706; and the expenditure out of the fund, £5,337,843. The rateable value of the city at March, 1921, was £5,437,046. Glancing at the figures relating to the gas undertaking, it is seen that the revenue account showed a balance of income in excess of expenditure for 1920-21 of £200,107, which was carried to the profit and loss account. After providing for annuities, interest, and redemption of debt, this account exhibited a profit of £27,233, which was transferred to special maintenance account. There was no capital expenditure during the year. At March, 1921, the total expenditure on capital account was £2,993,028, and the gross amount of loans negotiated (including annuities) was £3,008,949. There was standing to the credit of the reserve fund £57,034. In the year under notice there was a sum provided from revenue for redemption of debt of £43,230; the gross amount so provided to the end of 1920-21 being £1,538,741. The balance of loans remaining to be provided for was £1,470,208.

STOCKPORT BOROUGH GAS ACCOUNTS.

Mr. S. Meunier, the Engineer and Manager of the County Borough of Stockport Gas Department, has presented to the Gas Committee his thirtieth completed year's report for the past year—his appointment dating back to 1891.

In it, he states his regret that the slight improvement recorded last year has, unfortunately, not been maintained. The causes enumerated in the report of 1919-20 as affecting results were still existent during the past year; but unfortunately to them were added (1) the unauthorized strike of workmen in July, which held up the undertakings in the Manchester area, (2) the coal strike in Yorkshire in October, which reduced the supplies of coal, and (3) the non-fulfilment, through various unforeseen circumstances, of the anticipated starting-up of the new carbonizing plant in time for the benefit of its better and cheaper working being felt the last three months of the financial year.

The cost of coal further increased during the year by no less than £22,802, or equal to about 29 p.ct., carriage by £6681, equal to over 75 p.ct., and carburetted water gas, oil, and materials by £16,871, or 84 p.ct. Compared with the same items for 1914 the increases respectively are coal 196 p.ct., carriage 96 p.ct., oil and materials 330 p.ct. In addition to the various items enumerated, there was other heavy extra expenditure. Wages went up over the previous year by £19,112, equal to nearly 29 p.ct., and over 1914 by £45,824 or 321 p.ct.; and maintenance of works £14,025, and over 1914 by £36,786 or 415 p.ct. Heavy increases also occurred in the smaller accounts such as rates and taxes, £8521, public lamps, £1900, management, £4103 (of which £2046 was for bank interest and commission), meters and stoves £1191, and chemical plant £3482, of which £1175 was for the tar plant (being a new charge this year). The strike of workmen in July last year, after crediting the saving on coal and wages, cost the department £4244, and the Yorkshire miners' strike £1620.

The increased rate of charge from the December quarter brought in an additional £19,364, meter rents £4473, stove rents £2537. Residuals, as anticipated, improved in value during the major portion of the year; and as the tar-distilling plant was started in April, full advantage was derived. The total increase in revenue from these sources amounted to £32,205, of which £15,044 was to the credit of tar and its products. The total increases in revenue amounted to £57,795, against an increased expenditure of £92,000 on trading account.

There was a further decrease in gas sold of 608,000 c.ft. over the year 1919-20, and of 65,294,000 c.ft. over the year 1913-14. Though a very satisfactory increase of 32,550,000 c.ft. had taken place by July 9, when the gas-workers' strike commenced (which was followed by strikes in other industries), the year closed amid a general trade depression. Each so contributed to a reduction in output, until the end of the financial year, the gain was more than lost.

Unfortunately, the tar and ammonia market did not fulfil its earlier promise; and during the last three months of the year there was a rapid fall. Pitch dropped from £10 7s. 6d. per ton in December, to £4 in March; the other products following suit in proportion.

Mr. Meunier closes his report with this remark: The outlook for next year seems much brighter, as the new carbonizing plant is now in full swing, and is showing favourable results, while there has already been a reduction in wages and cost of materials, and every promise of a fall in coal prices; so that, given a recovery in the value of residuals, which at the present moment are considerably down, and an improvement in the trade of the district, some of the deficit of the past few years should be (in part) recovered.

EFFECT OF THE COAL STOPPAGE AT STOCKTON.

Mr. W. W. Atley (the Gas Engineer) presented to the Stockton-on-Tees Corporation last week a report on the effect of the coal stoppage upon the gas undertaking. During the difficult period, he said, 846 tons of British coal at 74s. 4d. per ton, and 3367 tons of foreign coal at 92s. 2d. per ton, were purchased. The foreign coal proved most disastrous for gas making, and only produced 6700 c.ft. per ton, against an average of 11,500 c.ft. per ton of English coal. These extra costs and the reduced gas yield meant a financial loss to the undertaking of £15,894. Technical Press reports showed that in the same way Middlesbrough had lost £50,000, and Darlington £18,918.

Alderman M'Naughton (the Acting Chairman of the Gas Committee) referred to the progress being made in connection with the settings of new beds of retorts for the winter. Four beds had been laid, he said, and carbonizing had commenced with satisfactory results. He complimented the contractors, and said it had been a record in retort construction.

A proposal that the reserve stock of coal should be brought up to 2000 tons was challenged by Mr. Wilkinson, who urged that the amount should be 1000 tons, in view of the falling market. This was eventually agreed to.

Mr. Kersall, in reference to the coal dispute losses, said the extra cost of coal, as compared with the average for three months prior to the stoppage, resulted in a loss of £10,577; and, as a consequence of the reduced yield from foreign coal, there was a further loss of £4040. This was due to the folly of the Corporation in purchasing foreign coal.

Alderman M'Naughton, however, pointed out that the whole of the Council were responsible for the step which was taken to meet an emergency.

GAS-WORKS HELPED BY THE SOUTH METROPOLITAN COMPANY'S COAL AND COKE.

The South Metropolitan Gas Company state, in the October issue of their "Co-Partnership Journal," that £339,573 (the bulk of which went out of the country) represents the cost to the Company consequent upon the stoppage in the coal industry, which lasted from April 1 to July 4.

With regard to the assistance rendered to other undertakings by the South Metropolitan Gas Company during this stoppage, the "Co-Partnership Journal" says: It is fairly well known that, when the stoppage began on April 1, the coal stocks of the Company were considerable; and everything possible had been done to prepare for the bad time coming. In consequence, the people of South London were protected from many hardships, and—what is not so well known—large quantities of coal and coke were requisitioned for other gas-works, some of which would not otherwise have been able to keep going. Readers will be interested to know that coal from the Company's stocks was supplied to the gas-works of—

Aldeburgh,	Hertford,	Northampton,
Barnet,	Huntingdon,	Pangbourne,
Bedford,	Maidenhead,	Peterborough,
Bicester,	Maldon,	Stevenage,
Chatteris,	March,	Toddington,
Ely,	Melton Mowbray,	Uxbridge,
Eye,	Mundesley,	Wandsworth and Wimbledon,
Finedon,	Newmarket,	
Hemel Hempstead,	Northfleet,	Watton (Norfolk).

Coke, mainly for the generation of water gas, was supplied to the gas-works of—

Aldershot,	Horsham,	Sheppey,
Barnet,	Ilford,	Southampton,
Bath,	Kibworth,	Southgate,
Bexhill,	Lea Bridge District,	Tonbridge,
Brentford,	Letchworth (Garden City),	Tottenham and District,
Chichester,	Maidenhead,	Tunbridge Wells,
Commercial Gas Co.,	Maidstone,	Watford,
Croydon,	Mundesley,	Waltham Abbey and Cheshunt,
Gas Light & Coke Co.,	North Middlesex,	Wandsworth and Wimbledon,
Harrow & Stanmore,	Pinner,	
Harwich & Dovercourt,	Reading,	Yorktown and Blackwater.
Haslemere,	Seaford,	
Hoddesdon,	Sevenoaks,	
Hornsey,		

A large quantity of coke was also supplied to the Great Eastern Railway and the South Eastern and Chatham Railway. We do not suggest that our stocks were accumulated with any idea of helping the industry at large; but we think it should be known that, as a matter of fact, the places mentioned above were greatly helped by the forethought of the management of our Company.

SOCIETY OF CHEMICAL INDUSTRY.

Annual Dinner.

Sir William Pope, F.R.S., presided at the annual dinner of the Society of Chemical Industry, last Friday, at the Connaught Rooms, Kingsway.

Prof. H. E. ARMSTRONG, F.R.S., proposed "The Society," and said that the most significant action in the whole history of the Society of Chemical Industry had been the recent visit to Canada. They must realize that, from the point of view of chemistry, Canada was the country of the future for chemists. It was the most powerful region in the world; and we must look forward to the translation of a very considerable proportion of our chemical industry to that region at no very distant date. He was inclined to think that the Society would never be a success until it made its centre of gravity Lancashire, and not London. He did not believe they would ever develop the serious side of the work of the Society until they got away from London, and to the centre of things.

Sir WILLIAM POPE, replying to the toast, said it behoved them, more than they had done in the past, to cultivate in every possible way the relationships which had now been set up so intimately between themselves and their friends in Canada and the United States.

Dr. E. V. EVANS, proposing "The Visitors," referred to the presence of representatives of many of the allied institutions and societies, and the close relationship there exists between chemists and engineers. The chemical industries at the present time were in by no means the flourishing state all would wish. This was largely due to the slump in trade; and luckily there was a definite sign of better business coming along in the future. It was satisfactory to know that they had at last brought the Government to realize that this country must have an organic chemical industry, if it was to maintain its safety in the future. This was proved by the passing of the much-criticized Dyestuffs Bill, which was not a measure of protection in the old political sense, but a measure for the protection of organic chemistry, which at that time had reached a vital stage in its development. There was a general impression that the dye industry was a weak child, fed on "Parliamentary Glaxo," and that it would never have a possible chance of arriving at manhood. He thought he could assure them that this was not so. The industry had had many setbacks. Yet whereas in 1913 we imported dyes to the value of £20,000, and made to the value of £2000, in 1920 these figures were just reversed. There was every sign that during the next few years chemists would be up-against a bigger problem than they had ever had to tackle before; and in this work they would require the help of the allied sciences. Soon after the armistice, he had been allowed to go in detail over the Rhineland factories; and what struck him there was that the applied chemist in Germany was most ably catered for in everything appertaining to engineering; and, in addition to this, there was real sympathy between the chemist and the engineer.

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¶ It must be accessible and extremely easy of maintenance.

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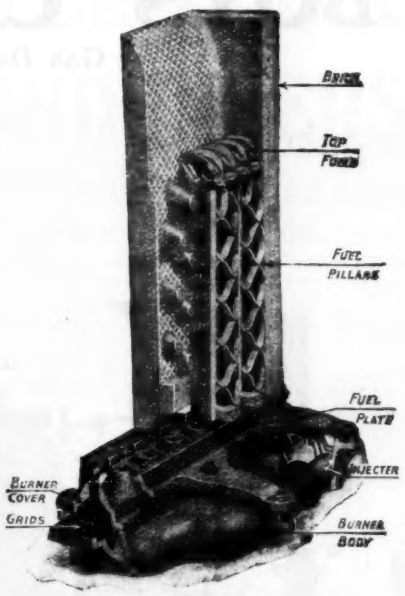

The Main Fuel Plate.

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ETC.

The toast was replied to by Sir GEORGE GOODWIN (President of the Institute of Metals) and Sir FRANK HEATH (of the Department of Scientific and Industrial Research). The latter rather hinted that, unless bodies such as the Society of Chemical Industry educated public opinion to insist that means for adding to our knowledge by way of research should be found, the provision of funds for this purpose by the Government might be one of the things which would be abandoned, owing to the present state of the national finances.

GLOVER AND MAIN, LTD.

The Annual General Meeting of Messrs. Glover and Main, Ltd., was held at No. 25, Princes Street, Oxford Circus, W., on Tuesday, the 4th inst.

The CHAIRMAN (the Rt. Hon. T. M'Kinnon Wood), in moving the adoption of the report and accounts for the year ended June 30, referred to the death of Mr. Richard T. Glover, who was Chairman of the Company from 1897 to 1912, when he retired. [It was resolved that an expression of the sympathy of the shareholders should be conveyed to Mrs. Glover and relatives.] The Chairman (continuing) said it had notoriously been an anxious year to everyone in business; but he thought in their case the results had not been unsatisfactory. At the beginning, raw materials were very dear, deliveries were slow and uncertain, and it was necessary, in order to maintain production, to buy some months ahead. Believing, as he did strongly, that the boom was temporary, and was certain to be followed by a slump and falling prices, this was a position of considerable anxiety. By the exercise of great care in buying, they had avoided having very heavy stocks of dear material; and, of course, they had valued their stocks for the accounts at the market prices of the day. Expenses had necessarily increased largely. The state of exchange in foreign countries had been a serious obstacle to their export trade; and in business with the Dominions, they had had to face high freights and exceedingly high tariffs—as much as 35 p.ct. in Australia—and in some cases an unsatisfactory financial situation which prevented them obtaining remittances on the usual terms. Nevertheless, the turn-over was satisfactory—in money value larger than in any previous year. As the cost of material fell, though wages were very high during the year, the prices of meters and stoves had been twice reduced by 10 p.ct. and 5 p.ct., and by 7½ p.ct. and 5 p.ct. respectively. He thought it was satisfactory that, in spite of all they had had to contend against, they had made sufficient profits to maintain the dividend paid last year of 8½ p.ct. Their financial position was satisfactory and strong. The debentures had been paid off; and there were very considerable reserves.

The report was adopted, and the following dividends declared: At the rate of 5 p.ct. per annum (less tax) for the six months ended June 30, 1921, making, with the interim dividend paid, 5 p.ct. for the year upon £50,000 preference share capital. At the rate of 11 p.ct. per annum (less tax) for the six months, making, with the interim dividend paid, 8½ p.ct. for the year, upon £200,000 ordinary share capital.

The Rt. Hon. T. M'Kinnon Wood and Mr. A. P. Main were re-elected Directors.

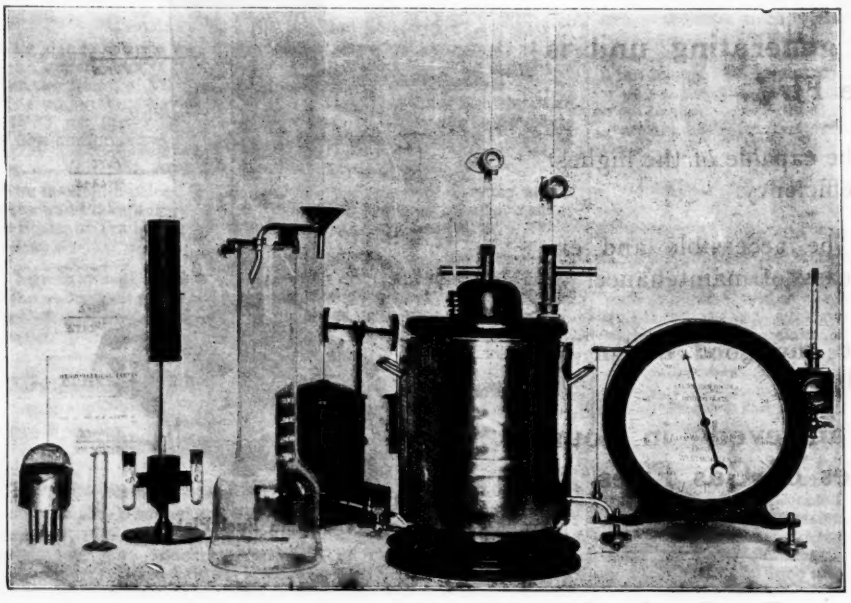
OUTLOOK FOR THE ENGINEERING INDUSTRY.

Speaking of the engineering industry in its widest sense, Dr. H. S. Hele-Shaw, LL.D., M.Inst.Mech.E., has been lately declaring that, if he reads the signs of the times aright, there is a growing hope of restoring pre-war prosperity. He sees indications that the pernicious idea that regards this country as a water-tight compartment, which can manufacture for itself, buy from itself, and sell to itself, is disappearing. We do not, he said, produce enough food to live upon, or raw materials of most kinds; and so we must look to the outside world. What the country wants from outside must be obtained by barter; and this can only be put into practical operation by producing (as a result of our engineering industry) better and cheaper products, so as to induce the world to take them in exchange for what we want, in preference to the products of our rivals. Here we come, then, to the *crux* of the whole matter. Both employers and workmen must combine to this end—since any narrow, selfish, short-sighted policy is bound to bring in its train the punishment of want and suffering. He is optimist enough to believe that all classes have been brought to realize that this is the only cure for the present terrible state of things in the country. On all hands there are to be seen appliances for aiding labour. Avoiding the expression "labour-saving appliance," and using in its place that of "labour-superseding device," he went on to give his views as to what must be done. Whenever a labour-superseding device is introduced, some effort must be made to provide work at a better rate for those whose work is superseded. Then, instead of meeting the introduction of a labour-superseding device with opposition, it would be welcomed with enthusiasm. It is the failure to realize this that has always led to trouble in the past—whether in engineering or anything else. Denis Papin, who put the first steamboat in the Rhine, was nearly killed by the Rhine boatmen, and his boat was destroyed. Dud. Dudley, the man who superseded charcoal by pit coal to smelt iron, had his works destroyed; and he barely escaped with his life from the charcoal burners. Now, a labour-superseding device is not always profitable; and here the Government can wisely step in and encourage the employer in the use of such devices, and at the same time assist in some way in the provision of work for those whose labour is superseded.

The occasion of these remarks was a dinner on Tuesday of last week—with Captain H. Riall Sankey, C.B., C.B.E., R.E. (Ret.), the President of the Institution of Mechanical Engineers, in the chair—to commemorate the successful co-operation of employers and workers,

BOYS CALORIMETER.

Gas Referees Latest Pattern.



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as exemplified at the Shipping, Engineering, and Machinery Exhibition at Olympia. There were a large number of guests present, who showed themselves in agreement with the views expressed by different speakers that the exhibition had been a very useful one, and that the Organizer (Mr. F. W. Bridges) had done his work well. Captain Sankey said that, as Vice-Chairman of the Committee of Experts, he had had an excellent opportunity of noting the keen interest that had been taken in the exhibition both by employers and employed.

The proposer of the toast of "Success to the Engineering Industry" (when replying to which the remarks already quoted were made by Dr. Hele-Shaw) was Mr. W. A. Appleton, the Secretary to the General Federation of Trade Unions, who declared that, in spite of all the great obstacles existing, it is still possible to look to the future with hope and confidence. Operative engineers as a class are, he said, among the most loyal people of the community. Revolutions will do nothing towards giving the workers the control of industry. They can only gain what is supposed to be their greatest desire by association, and understanding, and co-operation with the employers.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Oct.* 10.

On the London tar products market, after a period of quietude in pitch, in which the price was more or less nominal, it is understood that business has been done recently for export, and the prices realized have been about 60s. to 62s. 6d. per ton net at makers' works. The continued fine weather has enabled further quantities of tar materials to be put on the roads, beyond the usual date of stoppage for this kind of work. Creosote remains steady, as also are benzole, toluole, and solvent naphtha.

Sulphate of ammonia is in fairly good demand for home farmers, on the basis of the Federation's prices.

Tar Products in the Provinces.

Oct. 10.

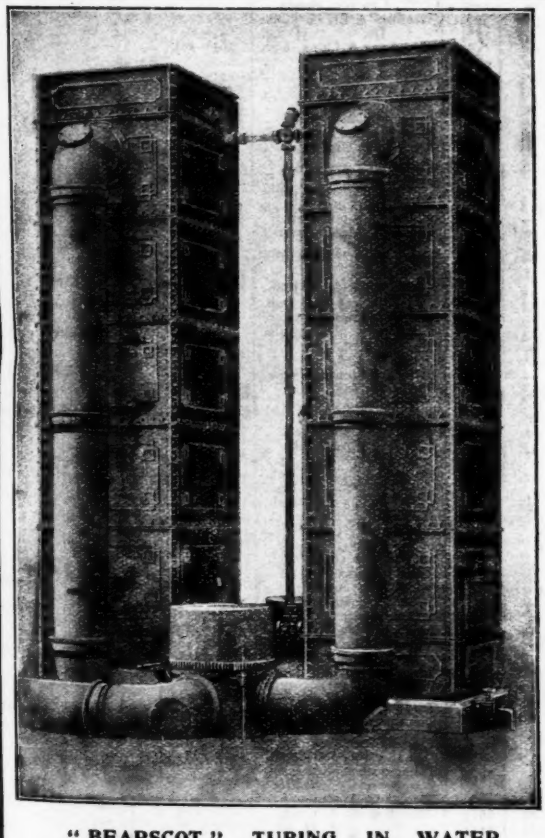
The average values for gas-works products during last week were: Gas-works coal tar, 50s. to 54s. Pitch, East Coast, 62s. 6d. to 67s. 6d.; West Coast—Manchester, 57s. 6d. to 62s. 6d.; Liverpool, 57s. 6d. to 62s. 6d.; Clyde, 57s. 6d. to 62s. 6d. Benzole 90 p.ct. North, 2s. 4d. to 2s. 6d.; crude 65 p.ct. at 120° C., 1s. 11d. to 2s. naked at makers' works; 50-90 p.ct., naked, North, 2s. 3d. to 2s. 4d. Toluole, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 11d. to 11½d. Solvent naphtha, naked, North, 2s. 8d. to 2s. 9d. Heavy naphtha, North, 2s. 7d. to 2s. 9d. Creosote, in bulk, North, liquid, 8½d. to 9d.; salty, 7⅝d. to 8¼d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 6d. Naphthalene, £20 to £30; salts, £7 to £9, bags included. Anthracene, "A" quality, 8d. to 10d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

There is not much fresh in the tar products markets since I last reported. The position as regards pitch is extremely uncertain, and very few people now take a favourable view of the situation. It is realized that fuel must come down to a much lower range of values, and this, in turn, means that briquettes will have to be sold at low prices. Consequently briquette manufacturers must have cheap pitch and cheap slack. At the same time it is evident that the demand for pitch for road making and repairing purposes will not sustain the market in the winter months. There is also the fact, which cannot be overlooked, that Germany is becoming a serious competitor in this line. The latest values of pitch, so far as they are able to be fixed, range from 55s. to 77s. per ton, according to position and point of delivery. There is a better demand for solvent naphtha; and it is now comparatively easy to dispose of everything that comes to the market at about 3s. to 3s. 2d. per gallon. Cresylic acid is steady at 2s. 6d. per gallon; but carbolic acid is still a nominal market. Makers are not doing anything in crude 60's; but the price which they can now obtain for it is 1s. 4d. to 1s. 6d. per gallon. Crystals 40 p.ct. are selling at 6d. per lb. Creosote remains a fairly good market at 8½d. per gallon. Naphthalenes are quiet; crudes being worth from £5 to £8 and refined £14 10s. to £17 per ton. Benzole 90 p.ct. is quoted at 3s. per gallon on rail, and pure benzole at 3s. 6d. Tar is in fair demand at 57s. 6d. to 60s. per ton. Prepared tar still quotes 80s. to 85s. per barrel. Business in intermediate products continues quiet; but fair inquiries are being received, and trade is gradually becoming of larger volume. Salicylic acid is steady at 1s. 4d. per lb. for technical grade. Aniline oil and salt are inquired for, both on home and export accounts; and the markets of the Far East are showing much more interest than for some time past. The latest values are 1s. 7d. and 1s. 8d. per lb. respectively.

Sulphate of Ammonia.

There is very little change in the position of sulphate of ammonia, except that the higher prices which have been established for deliveries during November and December are somewhat restricting inquiries at the moment. Export values are fairly well maintained at £16 per ton. During September, there were exported 12,262 tons of sulphate of ammonia, valued at £190,604, compared with 13,250 tons, having a value of £501,891, in September, 1920. For the nine months ended Sept. 30, we have exported 97,149 tons of sulphate of ammonia, having a total value of £2,210,374, which compares with 76,118 tons, of a total value of £2,451,717, for the similar period of 1920. Notable buyers of this material in recent months have been the Dutch East Indies, Japan, and France; and the trade being done in the two latter directions gives hopes for much better things in store. That we have not lost the trade of Japan in sulphate of ammonia, in which she was, in pre-war days, our principal customer, is much to be thankful for.



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Glasgow Gas Desired for Clydebank.—A Special Sub-Committee of the Glasgow Corporation Gas Committee have considered an application from the Town Council of Clydebank for a supply of gas to their housing scheme at East Kilbowie. The Special Sub-Committee, after an interchange of views, and after careful consideration of a statement submitted by the Assistant General Manager, showing an estimated capital expenditure of £5535 involved in the laying of mains and services and supplying and fixing meters and cookers, and a total revenue of £513 per annum which the Gas Department would receive from the sale of gas to the houses (assuming each householder consumes 14,000 c.ft. a year), recommend that the supply asked for be not granted, unless the Clydebank Town Council guarantee to pay to the Gas Department annually, for a period of fifteen years, a sum equal to 10 p.ct. on the capital expenditure, less one-eighth of the total revenue received from the sale of gas to the houses.

Mains for Housing Schemes.—At a meeting of the Housing Committee of the Worcester City Council held last week, the Town Clerk was directed to telegraph the Ministry stating that the contractors for the Northwick houses complained of the delay in furnishing the gas supplies, and pressing for an immediate reply to a letter of theirs dated Sept. 6. A communication has been received since the meeting stating that the Ministry regarded gas-mains as capital plant to be laid down at the expense of the undertaking concerned (the Gas Company), and that they had constantly refused, throughout the country, to permit payments to be made for such plant at the expense of the Exchequer, but suggesting that a satisfactory settlement might be made with the Company, and offering to negotiate direct with them. It was added that, where gas could not be obtained without payment for mains, the project of gas supply for the sites must be abandoned—at any rate, until the Company can deal with the matter on a more normal basis.

STOCK MARKET REPORT.

LAST week brought about hardly any change in the general tone of things on the Stock Exchange, which meant that business was a great deal too quiet, and that markets were mostly dull. But the gilt-edged market was exempt from this weakness, and Home Government issues were particularly strong. All the big four materially advanced; Friday's figures being: Consols 48¾-49⅛, War Loan, 89¼ 89⅛, Funding 71⅜-72⅛, Victory 76¼-77. Bonds were in good demand. Indians gave way. Home Rails met with fair support; but final prices were not the best of the week. Canadians and Argentines eased.

Business in the Gas Market showed increased activity, and a goodly number of advances in quotation. In the London Companies, Gas Light and South Metropolitan recoiled a point after their recent gains; but Commercial was steady. The Suburban and Provincial Group in general were firm, and Tottenham "A" and "B" and Wandsworth "B" advanced. In the Continentals, Imperial made a big jump of 10, in confident expectation of further receipts from Germany, which may or may not be realized. European was steady. Primitiva shares were firm, and three of the debenture issues rose 2 each.

Bargains done for cash during the week were as follows: On Monday, Brentford debenture 58, 59, Commercial 4 p.ct. 55⅛, Gas Light ordinary 59¼, 59⅛, 59⅜, 60, Imperial Continental 127, 127½, ditto debenture 79½, 80½, Plymouth and Stonehouse 61½, Primitiva 14s. 7½d., 14s. 9d., 15s., ditto preference 39s. 6d., 40s., 40s. 3d., 40s. 4⅛d., 40s. 7½d., 40s. 9d., South Metropolitan 69⅛, 69⅝, 70⅜, ditto 6½ p.ct. debenture £57 paid 61, ditto fully-paid 101¼-101⅜, Richmond 5 p.ct. 49½, 50. On Tuesday, Bournemouth 5 p.ct. 8, 8 1/32, ditto "B" 9, 9 3/32, ditto preference 8, 8 1/32, Commercial 4 p.ct. 55⅛, 56⅛, ditto debenture 45⅛, Imperial Continental 126½, 127, 127⅛, Primitiva preference 40s., 41s. 3d., South Metropolitan 69½, 70, ditto debenture 49, 49⅛, ditto 6½ p.ct. debenture £57 paid 60⅝, ditto fully-paid 101¼-101⅜, South Suburban debenture 75, Wandsworth "C" 56, 56⅛, ditto Epsom 56⅛, 57, Eastbourne 5 p.ct. "A" 78½. On Wednesday, Brentford "A" 69, ditto "B" 63, Commercial 4 p.ct. 56⅛, European 7½, Gas Light ordinary 59, 59⅜, 59¾, ditto preference 59⅜, 60, Imperial Continental 126½, 127, 127⅛, 128, 128½, 129, Oriental 89, Primitiva 14s. 7½d., 15s. 4½d., ditto preference 40s., South Metropolitan 69, 69½, 70, ditto debenture 50, ditto 6½ p.ct. debenture fully-paid 100½, 101½, South Suburban debenture 74½, Broadstairs 7 p.ct. "B" 37½. On Thursday, Bombay 3 1/16, Cape Town preference 4½, Commercial 4 p.ct. 55⅛, European 7, 7⅛, Gas Light ordinary 59, ditto preference 59½, 60, ditto debenture 51⅛, Imperial Continental 128, 129, 130, 131, Primitiva 14s. 6d., ditto preference 39s. 3d., 40s. 6d., South Metropolitan 69, ditto 6½ p.ct. debenture £57 paid 60½-60⅜, ditto fully-paid 100⅜-101½, South Suburban debenture 75. On Friday, Brentford "A" 70, British 21⅛, Commercial debenture 45, Gas Light ordinary 58⅛, 59⅛, ditto preference 59⅜, 60, ditto debenture 51¼, 51½, Imperial Continental 135, 138, 140, 141, 143, 144, 145, Primitiva 13s. 9d., 14s. 3d., ditto preference 38s. 9d., 39s., 39s. 6d., 40s., South Metropolitan 68¼, 68⅜, 69, ditto 6½ p.ct. debenture fully-paid 100¼-101¼, Tottenham "B" 51⅛, 51⅛.

In the Money Market, rates in the earlier part of the week were firm; but the situation soon eased as ample supplies came in, and this continued up to the close. Discount terms followed much the same line. Silver varied, but closed with little change. The Bank rate is 5½ p.ct., as fixed on July 12.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.ce.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref.	...	50—55	...
1,551,868	,,	Apl. 14	2½	3 3/16%	Alliance & Dublin Ord.	59—64	45—48	...
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	46—51	...
280,000	5	Aug. 11	7½	4/-	Bombay, Ltd.	5¼—6¼	3—3⅛	3 1/16
100,000	5	,,	16	4/7½	Bourne- { 5 p.c.	...	7⅞—8¼	8—8 3/32
383,110	10	,,	7	7/-	mouth Gas { B 7 p.c.	15—15½	8¼—9¼	9—9 3/32
115,000	10	,,	6	6/-	and Water { Pref. 6 p.c.	13½—14	7½—8½	8—8 3/32
162,063	—	June 30	—	4%	{ 4 p.c. Deb.	...	54—59	...
992,045	Stk.	July 15	14	56/-	Brentford A Consolid.	261—266	67—70	69—70
734,920	,,	,,	11	55/-	Do. B New	204—209	62—65	63
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—72	...
221,400	,,	June 15	4	4%	Do. 4 p.c. Deb.	91—93	57—59	58—59
214,775	,,	Aug. 26	11	10½%	Brighton & Hove Orig.	208—213	110—115	...
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	77—82	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Sept. 29	12½	10%	British	44—45	21—23*	21½
120,000	Stk.	June 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	55—58	...
243,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	42—45	...
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—2½	6¼—7½	...
100,000	10	Apl. 28	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5½	4½
100,000	Stk.	June 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	53—58	...
137,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	July 28	5/9/4	42/8	Commercial 4 p.c. Stk.	106—108	54—57	55½—56½
560,000	,,	,,	5½	38/4	Do. 3½ p.c. do.	103—105	52—55	...
475,000	,,	June 15	5	5%	Do. 5 p.c. Deb. Stk.	69¾—71½	44—47	45—45½
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	18—20	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	30—35	...
51,600	,,	Aug. 26	15	15%	Croydon A 10 p.c.	...	150—155	...
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	...	120—125	...
492,570	Stk.	—	6	4½%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	7—7½	7—7½
16,298,975	Stk.	Aug. 11	4/17/4	46/8	Gas 4 p.c. Ord.	98—102	58—60	58½—60
2,600,000	,,	,,	3½	35/-	Light 3½ p.c. max.	76—79	44—46	...
4,062,235	,,	,,	4	4%	and 4 p.c. Con. Pref.	96—99	58—60	59½—60
4,674,850	,,	June 15	5	5%	Coke 3 p.c. Con. Deb.	72¼—74½	50—52	51½—51¾
130,000	,,	Dec. 11	10	10%	10 p.c. Bonds.	...	...	...
52,500	,,	Sept. 14	5	3½%	Hastings & St. L. 5 p.c.	...	48—50	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	27—29	34—36	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16¾	5—6	...
86,600	Stk	Aug. 26	9	9%	Hornsey 7 p.c.	...	78—83	...
131,000	,,	July 28	7½	7½%	Ilford A and C	131—134	78—80	...
65,780	,,	,,	6½	5½%	Do. B	115—118	57—59	...
63,500	,,	June 30	4	4%	Do. 4 p.c. Deb.	92—94	54—56	...
1,976,000	,,	May 27	9	5%	Imperial Continental	150—160	135—145	126½—145
1,235,000	,,	Aug. 11	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	79—81	79½—80½
235,242	,,	Mar. 30	6½	3½%	Lea Bridge Ord. 5 p.c.	119—121	68—70	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A.	211—213	...	...
					{ B.	146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 11	7/5/6	6%	Maidstone 5 p.c.	...	54—56	...
63,480	,,	Dec. 30	—	3%	Do. 5 p.c. Deb.	...	40—43	...
75,000	5	June 11	6	5%	Malta & Mediterranean	4¼—4⅝	1¾—2¼	...
250,000	100	Oct. 3	4½	4½%	Met. of { 4½ p.c. Deb.	99—101	88—96*	...
					Melbourne {			
541,920	Stk.	May 27	4	6%	Monte Video, Ltd.	11½—12	55—60	...
1,875,892	,,	July 28	4½	3%	Newcastle & Gatsh'd Con.	98½—99½	57½—58½	...
529,705	,,	June 30	5½	3½%	Do. 3½ p.c. Deb.	82—85	48½—50½	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12½—13½	...
55,940	10	,,	7/14/0	5/3	,, ,, 7 p.c.	14—15	7½—8	...
300,000	Stk.	May 12	8	8%	Oriental, Ltd.	117—122	88—93	89
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	2—3	...
188,120	Stk.	June 30	—	3½%	Plym'th & Stonch'se 5 p.c.	...	64—67	64
60,000	50	Aug. 26	15	60/-	Portsea Island, B	128—131	64—67	...
100,000	50	,,	12	55/-	Do. C	118—121	51—54	...
249,980	5	April 29	8	—	Primitiva Ord.	5¾—6	1 1/16—1 3/16	13/9—15/4½
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	1¾—2¼	1¾—2¼	38/9—41/3
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	4¼—5	65—67	
600,000	Stk.	July 28	4	4%	Do. ,, ,, 1911	97—98	42—45	...
546,198	,,	June 30	4	4%	River Plate 4 p.c. Deb.	...	42—45	...
150,000	10	Sept. 29	6	6/-	San Paulo { 6 p.c. Pref.	85—87	6—6½*	...
125,000	50	June 30	5	5%	{ 5 p.c. Deb.	10½—11	15—18	...
135,000	Stk.	Aug. 26	10	5%	Sheffield A	47—49	61—62	...
209,984	,,	,,	10	5%	Do. B	223—224	60—62	...
523,500	,,	,,	10	4½%	Do. C	220—222	59—61	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	June 30	9	8%	South African	10½—11¼	7—9	...
6,609,895	Stk.	July 28	5/4/0	5%	South Met. Ord.	111—113	68—70	68½—70½
250,000	,,	July 14	—	5%	Do. Red. Pref.	...	93—95	...
1,895,443	,,	,,	3	3%	Do. 5 p.c. Deb.	72½—74½	48—50	49—50
224,820	,,	Feb. 25	8½	7½%	South Shields Con. Stk.	137—139	85—87	...
1,087,795	,,	Aug. 11	6	5½%	S'th Suburb'n Ord. 5 p.c.	114—116	67—69	...
368,837	,,	June 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	73—76	74½—75
647,740	,,	May 12	7½	3½%	Southampton Ord.	99—102	55—58	...
121,275	,,	June 30	4	4%	Do. 4 p.c. Deb. Stk.	...	59—61	...
120,000	,,	Aug. 11	—	6%	Tottenham { A 5 p.c.	135—138	63—65	...
782,273	,,	,,	6	4½%	District { B 3½ p.c.	113—117	53—55	51½—51½
181,255	,,	June 15	4	4%	{ 4 p.c. Deb.	87—89	54—57	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	41—50	...
256,476	Stk.	Aug. 26	5	3½%	Tynemouth 5 p.c. max.	108½—109	66½—68½	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Aug. 11	8½	66/3	Wandsworth A 5 p.c.	151—156	78—80	...
253,636	,,	,,	6½	51/3	Do. B 3½ p.c.	129—134	59—61	...
108,075	,,	,,	—	46/4½	Do. C	...	55—57	56—56½
140,865	,,	,,	—	46/4½	New Ordinary	...	57—59	...
352,000	,,	,,	6½	45/-	Wimbledon 5 p.c.	117—122	53—55	...
98,000	,,	,,	6½	50/-	Epsom 5 p.c.	121—126	56—58	56½—57
88,476	,,	June 30	4	3%	4 p.c. Deb. Stk.	68—69	44—47	...

* Ex Div.

Skegness Gas Undertaking.—Difficulties have long been experienced by the Skegness District Council regarding the gas supply; the suggestion which has been put forward in explanation of many present troubles being that too high a price was paid for the undertaking when it was acquired. Incidental to the matter, further serious considerations have now arisen, a communication having been received from the Electricity Commissioners asking whether it was desired to make any additional observations on the subject of a public electricity supply for the town, as otherwise the powers of the Council in such respect might be forfeited. Mr. W. Clayton (the Chairman) pointed out that it was certain that a sum of £4000 or so would shortly have to be expended upon the gas-works, in order to cope with the increasing requirements of the town; and he was strongly in favour of embarking upon a £10,000 electricity scheme. It was decided to convene a meeting of the whole Council to consider the matter at an early date.

Alderman Hall, J.P., C.C., the Chairman of the Workington Corporation Gas Committee, was last week elected Mayor of the borough, in succession to the late Alderman W. J. Dodgson. This is the fourth time that Alderman Hall has been Mayor.

Messrs. Cash, Stone, & Co., have taken into partnership, as from the 1st inst., Lieut.-Colonel Wilfrid Cabourn Smith, D.S.O., M.C., A.C.A. (late K.R.R.C.) who served under articles in their London office, and subsequently was engaged there until he joined the army in 1914. The style of the firm will remain as heretofore.

The Harpenden District Gas Company are offering for sale by tender £5000 of additional capital stock, with an 8 p.ct. standard rate of dividend, subject to the sliding-scale. At the present price of gas, the authorized rate of dividend is 11 p.ct. per annum. Tenders must be sent in to the Company at Harpenden (from whom prospectuses may be obtained) not later than noon on the 21st inst.

The Disposal and Liquidation Commission announce that they have entered into a contract with Messrs. Charles Tennant & Co., Ltd., of No. 93, West George Street, Glasgow, chemical merchants and manufacturers, for the disposal of the unsold balance of chemicals and explosives on a commission basis—Messrs. Tennant undertaking the inspection, cataloguing, and grading of the various materials. All future inquiries with regard to these materials should be referred to them at the above address.

The Blackburn Corporation are promoting a Private Bill in Parliament which, by agreement, will contain a clause doing away with the right of the Corporation to supply gas within the area of the Oswaldtwistle District Council.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 5.]

APPLICATION FOR RESTORATION OF LAPSED PATENT.

Notice is given that WILLIAM BROWN DAVIDSON and W. C. HOLMES & Co., LTD., have made application for the restoration of the patent granted to WILLIAM BROWN DAVIDSON and ALFRED JOHN LIVERSEDGE for an invention entitled "Improvements in apparatus for washing gases and for analogous purposes," No. 9302 of 1914, dated April 15, 1914.

Nos. 25,403 to 26,044.

BEVER, A.—"Air and gas compressors." No. 25,412.
BULLIVANT, F. A.—"Elevators and conveyors." No. 25,603.
DEANE, N.—"Gas." No. 25,476.
DELVE, W. H.—"Atmospheric gas-burners." No. 25,475.
GARRATT, W. J.—"Gas fires or stoves." No. 25,630.
GRASEBY, R. C.—"Igniting mechanism for gas-burners, &c." No. 25 868.
HUMPHRYES, W.—See Deane. No. 25,476.
HUTCHINS, T. W. S.—"Apparatus for distillation of carbonaceous materials." No. 26,023.
LEE, R. C.—See Garratt. No. 25,630.
NOBLE, E. & T. R.—"Incandescent gas-burners." No. 25,718.
OLDFIELD, G. H.—"Gas-cleaning apparatus." No. 25,437.
PRIDE, H. C.—"Pendant gas-light fittings." No. 25,579.
RAWLINSON, A. D.—"Method of light control for vehicles using gas illuminant." No. 25,623.
ROSENBERG, A.—"Suction-gas producer plant." No. 25,929.
SLATER, A. V.—"Estimation of small quantities of substances present in gases or liquids." No. 25,438.
TAYLOR, L.—See Oldfield. No. 25 437.
WALKER, T. B.—"Vaporizer for paraffin, &c., for diffusion in gas in gas-mains." No. 25,869.
WHITE, T. H.—See Walker. No. 25,869.
WILKES, A. H.—"Gas-heated radiators." No. 25,502.

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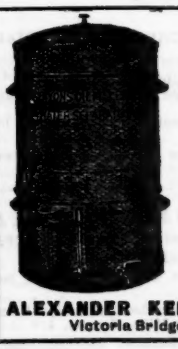

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